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AIR FORCE
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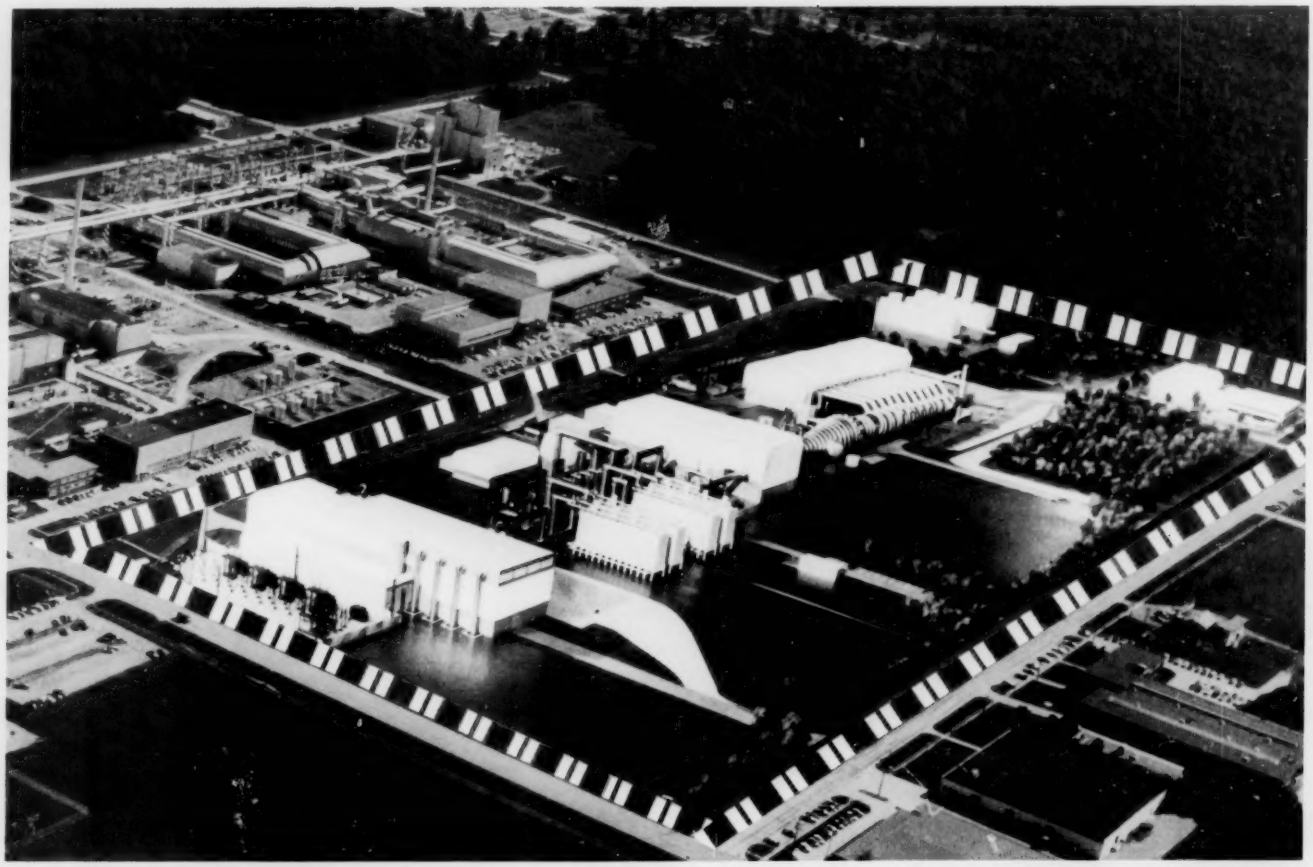
QUARTERLY

# Aeropropulsion Systems Test Facility



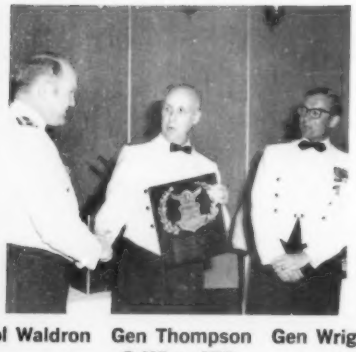
**...the most expensive single facility ever to be built by the Air Force Military Construction Program**

# ADC, SAC, USAFE Win Bordner Awards; Four Accept Services Citations

Gen Thompson Col Rubenstein
Cambria AFS

Gen Thompson Col Catlin
Torrejon AB

Gen Thompson Gen Wright
Castle AFB



Col Waldron Gen Thompson Gen Wright
Griffiss AFB

The William H. Bordner Awards for the outstanding prime electrical generating and heating plants in the Air Force were announced during the 1976 Engineering and Services Conference at Homestead AFB, Florida, in November. In addition, four citations were presented to outstanding personnel in the Services career field.

Bordner award winners include:

● **775th Radar Squadron, Cambria AFS, California, Aerospace Defense Command:** Category I: Prime electrical generating plant with an installed capacity from 100 to 2,000 KW.

● **Torrejon AB, Spain, US Air Forces in Europe:** Category II: Prime electrical plant with an installed capacity over 2,000 KW.

● **Base Hospital Heating Plant, Bldg 1182, Castle AFB, California, Strategic Air Command (SAC):** Category I: Heating plant with an installed capacity of 3.5 to 14 million BTU/HR.

● **Central Heating Plant, Bldg 117, Griffiss AFB, New York, SAC:** Category II: Heating plant with an installed capacity of 14 million BTU/HR.

Services awards were presented to:

● **Maj Norwood J. Meche, 56th Services Squadron Commander and Chief, Services Division, MacDill AFB, Florida:** Outstanding Services Manager Award. He was cited for his attention to detail, extensive technical knowledge and professional leadership qualities which enabled him to solve complex problems of great importance to his squadron and improve the quality of service throughout all of his responsibility.

● **Capt Gary H. Bain, Chief, Services Division, 52nd Combat Support Group, Spangdahlem, Germany:** Outstanding Junior Services Manager Award. He was recognized for his superior planning and leadership talents which were demonstrated by his management of a $2 million renovation project of billeting and dining facilities and his significant cost savings actions throughout Services Division functional areas.

● **CMSgt Clifford N. Cook, Food Service Superintendent, 3700 Air Base Group, Lackland AFB, Texas:** Outstanding Services Superintendent Award. Sergeant Cook was cited for his outstanding professional abilities, expertise, incisive judgement and diligence which directly contributed to the high degree of success currently being demonstrated by the largest food service operation in the Air Force.

● **TSgt Joseph R. Kellam, NCOIC, Clothing Sales Store, and NCOIC, Services Division, 4900 Air Base Wing, Kirtland AFB, New Mexico:** Outstanding Services Technician Award. He was recognized for his management ability, concern for people and unlimited capacity for work.

Gen Thompson Maj Mech
Outstanding Services Manager

Gen Thompson Capt Bai
Outstanding Junior Services Manager

Gen Thompson CMSgt Coo
Outstanding Services Superintendent

Gen Thompson TSgt Kellam Gen Reill
Outstanding Services Technician

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# Aeropropulsion Systems Test Facility

## . . . the most expensive single facility ever to be built by the Air Force Military Construction Program

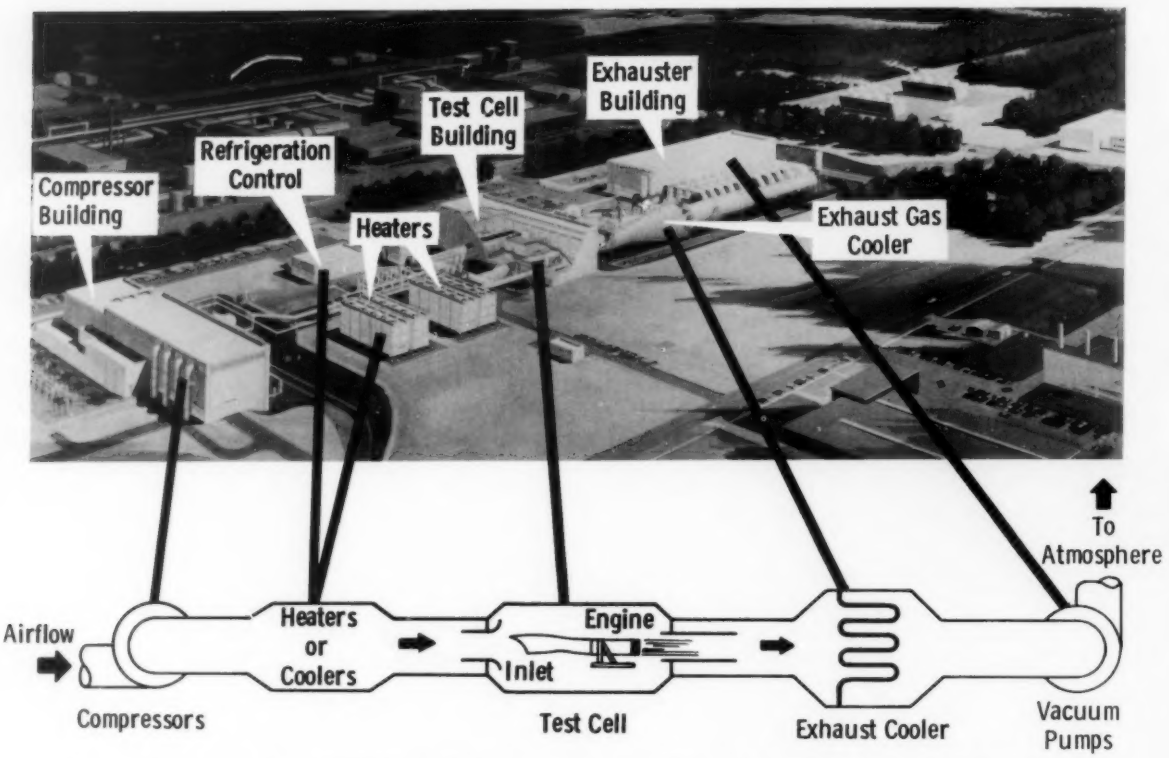



**Figure 1:** Artist's concept of the Aeropropulsion Systems Test Facility which identifies the major components.

by Maj Robert Holcomb, EIT

A contract for the construction of the most expensive single facility ever built by the Air Force Military Construction Program will be awarded early in 1977. This $437 million project, for an Aeropropulsion Systems Test Facility (ASTF) at Arnold Engineering Development Center (AEDC), Tullahoma, Tennessee, has had an interesting evolution as previously reported in an article which appeared in this publication. (See "Correcting a Serious Deficiency," **Air Force Civil Engineer,** May 1974.)

**Development of Requirement**

The performance and reliability of military and civilian aircraft are highly dependent upon the

performance and reliability of their propulsion systems. Today's technology in aircraft and propulsion systems development has outstripped the present capability to adequately test these systems to insure they meet predicted and required specifications. The lack of adequate test facilities increases the potential for after-production "fixes." Facilities built under the Unitary Wind Tunnel Plan after World War II remain the best ground test facilities the Air Force has. These national facilities at AEDC were authorized by Congress in 1949. They have been continually modified and improved, but still use some compressors and other equipment used in German facilities during World War II. However, further major improvement to these facilities is no longer economically or technically feasible. New, modern facilities are required for the higher performance engines needed for military and commercial aircraft that will be developed in the 1980s and beyond.

In the mid-1960s, in recognition of the existing inadequate test facilities, the Aeronautics and Astronautics Coordinating Board (AACB) launched an eight year study into requirements for test facilities to stay competitive in the worldwide aviation market. This joint National Aeronautics and Space Administration (NASA)-Department of Defense (DOD) group developed the National Aeronautical Facilities Program (NAFP) which consists of three facilities: the Subsonic Wind Tunnel Modification, the National Transonic Facility and the Aeropropulsion Systems Test Facility. Both the Subsonic Wind Tunnel Modification and the National Transonic Facility are NASA funded facilities. The ASTF, of course, is DOD funded and will cost more than the other two put together.

Final definition of the ASTF requirement represented a compromise between cost of the facility and designing a facility to meet all projected engine development testing requirements. In other words, ASTF is a balanced system which represents the best compromise of cost and performance versus determination of future test requirements. Growth potential for future requirements was designed into the facility to allow for increased air flow, temperature variables, altitude and the number of test cells.

**Figure 2: Comparison with the best facility available today.**

| | ASTF Specs | Best Available (US) Facility |
|---|---|---|
| Air Flow (lbs per sec) | 1,450 | 675 |
| Air Temp Range (°F) | −100° to +1,020° | −100° to +750° |
| Cooling System (tons/ refrigeration cap) | 23,000 | 9,510 |
| Motor Drive Systems (installed h.p.) | 611,000 | 344,500 |
| Test Cell Dimensions (dia & length) | 28′ x 85′ | 20′ x 103′ |
| Instrumentation Channels | 2,170 | 1,200 |
| Cooling Water (gal/min) | 387,000 | 140,000 |

**Figure 3: Breakout of various phases and description.**

| | |
|---|---|
| **Phase I** | |
| Started: | 2 November 1972 |
| Completed: | 1 August 1973 |
| Cost: | $2,498,063 |
| **Phase II** | |
| Started: | 1 December 1973 |
| Completed: | 30 September 1974 |
| Cost: | $2,972,256 |
| **Phase III** | |
| Started: | 1 January 1974 |
| Completed: | 30 September 1975 |
| Cost: | $3,947,819 |
| **Phase IV** | |
| Started: | 1 February 1976 |
| Completed: | 31 October 1976 |
| Cost: | $3,390,784 |

**Description and Performance of ASTF**

ASTF will consist of an air supply, air heaters, a refrigeration unit, two 28 foot test cells, and an exhaust unit, **Figure 1.** Though similar in concept to today's unique test facilities, it is considerably greater in size and performance. Propulsion tests are conducted with actual engines and appropriate segments of the aircraft hardware in the test cells where flight conditions will be simulated and varied. Each of the two test cells can be adjusted up to 85 feet in length and will be 28 feet in diameter. One cell will provide large flows of cold air at low pressure for subsonic testing; the other cell will accommodate higher pressures and temperatures for supersonic testing. However, the subsonic or the turbofan engine test cell was designed with limited capability for supersonic testing, and conversely, the supersonic or turbojet engine test cell was designed to have limited subsonic test capability.

The air supply for the ASTF is generated by a series of air compressors and directed to the test chamber, or the air could be directed through a refrigeration complex before reaching the test chamber. Still another route would divide the air as it leaves the generators, with part going to the heaters, and part to the refrigerators; then, through the use of a system of exhausters, change the air flow in the chambers from hot to cold or vice versa. As an example, to simulate a high altitude flight, the ASTF will decrease the pressure in the test chamber through the use of a vacuum system, and then gradually change the air temperature from hot to cold.

ASTF is designed to develop complete jet aircraft engine systems on the ground at conditions simulating actual flight environments. The complete systems, including portions of the aircraft that affect engine performance—inlets, exhaust nozzles, control systems—will be tested over a wide range of speeds and altitudes as well as the rapidly changing conditions encountered by maneuvers. ASTF's capabilities to perform these tests can best be illustrated by a comparison with the best US facility available today, **Figure 2.**

The materials and equipment required for construction — electric motors, compressors, refrigeration units, heaters, ducting, pumps, controls, electronics, computers — are currently available from commercial sources. Although the facility is large, it is similar to existing test facilities; therefore, it will involve standard construction techniques.

**Economics of ASTF**

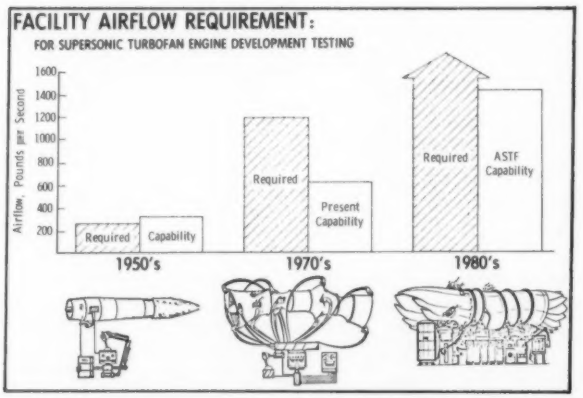
A question could be asked concerning how a single facility project costing $437 million could be defended in Congress. Certainly, the requirement to keep pace with future aircraft development, both military and civilian, in order to maintain dominance in the international market, dictates adequate ground test facilities. However, the economics of such a large monetary outlay must also be considered. In this regard, it is interesting to note that money invested in constructing engine development facilities historically has produced savings equal to many times the original investment. For example, the original amount appropriated for construction of the AEDC's Engine Test Facility (ETF) was $52 million. In 1950, that equated to the cost of approximately 17 B-36 bombers. In the early 1950s, some ETF tests, combined with tests at other facilities, helped one manufacturer improve the fuel consumption of a jet engine. Subsequently, 15,000 engines of this type were built and used by US and allied military forces for more than 15 years. The estimated fuel savings, 1.7 billion gallons, translates to approximately $500 million. Similar refinements in jet engines used in a fleet of 100 future transports for 10 years could pay for ASTF. Looking at it another way, the Air Force would recover the initial cost of ASTF by the correction of development problems in only two different models of jet engines.

**Programming ASTF**

Formal submittal of the project in the FY 1977 Military Construction Program (MCP) was preceeded by several events which figure significantly in supporting the requirement for the facility. The need for ASTF was initially brought to the attention of Congress by the President in his Aeronautics and Space Report of January 1971. In December 1971, the Air Force Scientific Advisory Board reviewed and endorsed the ASTF concept. This was followed by an industry user group review and endorsement of ASTF in December 1972.

**Figure 4: Seven construction packages.**

| Package No. | Title | Construction Period |
|---|---|---|
| 1 | Government Procured Equipment | Jan 77-Jan 79 |
| 2 | Site Preparation and Utilities | Jan 77-Jan 78 |
| 3 | Buildings | Jan 77-Mar 81 |
| 4 | Equipment and Piping | Jan 77-Aug 81 |
| 5 | Test Cells and Ducting | Jul 77-Aug 81 |
| 6 | Instrumentation and Controls | Jul 77-Aug 81 |
| 7 | Test Instrumentation System | Jul 79-Jan 81 |




*This illustrated graph shows how the requirements for propulsion test facilities have increased as the complexity and performance of jet engines have increased since the 1950's.*

In the interim, preliminary design commenced on ASTF and in August 1973, the Scientific Advisory Board again reviewed and approved the continued development of the project. In January 1975, the Aeronautics and Astronautics Coordinating Board solicited comments from industry and the academic community on the need for ASTF's capabilities. The Office of Management and Budget (OMB) requested the President's Scientific Advisor to assess the requirements and alternatives for aeronautical facilities modernization. Key findings of the group directed by the Advisor were reported to OMB in December 1975.

The FY 1977 MCP was selected as the fiscal year to seek funding and commence construction. This selection was made on the basis of the reviews mentioned, and more importantly, to be in phase with major new engine design technology efforts which will produce a demonstration engine in 1979. This event will be followed in turn by the development of the first engines using this new technology and requiring the ASTF in 1983.

Total authorization and funding were requested of the Congress for the single year FY 1977. Of the $802 million proposed in the Air Force MCP, $437 million or more than half, was devoted to this single project. The level of effort expended in defending this project before Congress can best be measured in terms of the number of questions solicited by the four committees involved and the number of inserts which were provided for the Congressional Record. During the hearings on ASTF, 104 replies were provided for the record and a full two days were devoted to open testimony before the Subcommittee on Military Construction, House Appropriations Committee. In addition to the Air Force principal witness and other Air Force back-up witnesses, testimony was provided by several top echelon officials. Beginning with the Air Force's opening statement, "This project is one of the most important facilities ever requested in the Air Force Military Construction Program . . . ," all of the witnesses solidly supported the require-

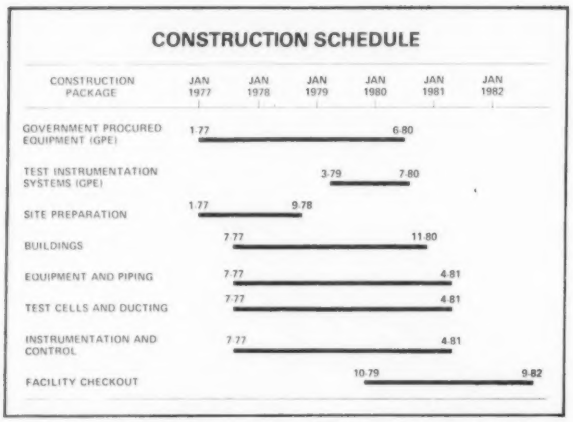



*Chart shows when certain activities related to ASTF are scheduled to take place. It is, of course, a projection that could change a bit as construction progresses.*

ment for the ASTF to insure maintaining Air Force superiority in aircraft development, both military and commercial.

**Design and Construction**

The contract for design of the ASTF was awarded to a joint venture composed of Daniel, Mann, Johnson, and Mendenhall with Norman Engineering Company, both of Los Angeles, California, on 2 November 1972. The contract was awarded for Phase I of the design effort with options for Phases II, III and IV at a total cost of $12,808,922. Considering the total estimated cost of construction, including 5 percent for contingencies and 5 percent for SIOH, this design fee was less than 3 percent of the construction cost. A breakout of the various phases of design with a brief description is in **Figure 3. Phase I** brought design to 20 percent completion and involved engineering trade-off studies and the selection of prime movers, and air supply and exhaust equipment. **Phase II** brought design to 40 percent completion and involved definition of the basic facility site plan, equipment arrangement and utilities layouts. **Phase III** brought design to 70 percent completion and included complete design drawings and specifications for long lead-time procurement equipment items and site work and utilities systems. It also provided for preparation of a detailed cost estimate for each of the seven construction packages. **Phase IV** will complete the design effort.

The seven construction packages proposed to facilitate bidding and scheduling are shown in **Figure 4.**

The government procured equipment (GPE) in **Package No. 1** will include air supply compressors and drives, refrigerant coolers, refrigeration machines and turbines, and air heaters, all in the air supply area. In the exhaust area, the GPE will include exhaust compressors and drives, intercoolers and exhaust gas cooler, and the exhaust gas pressure control valve and finally, the configuration and control valves, and the utilities (static starting equipment, all major electrical equipment, cooling tower and cooling water pumps).

The site development and utility systems comprising construction **Package No. 2** include site development, underground duct banks, cathodic protection, barometric wells, cooling water system and the utility systems. This last item includes potable water, sanitary sewer, steam, natural gas, nitrogen gas, high pressure air, test fuel, bulk fuel and electrical service.

Construction **Package No. 3,** Buildings, includes the civil, architectural, structural and electrical tasks to construct the required buildings; and, the construction of all mechanical systems.

Construction **Package No. 4** will install all government procured equipment, and construct the process systems as well as the fore and after sprays. Process systems involve cooling water, refrigerant brine, lube oil, steam and condensate, compressed air, hydraulic oil and test fuel.

Construction **Package No. 5** will involve the design, construction, and analysis of air supply and exhaust ducting, and components in the test cells to include cell hatches, venturies, silencers and expansion devices.

Construction **Package No. 6** and **Package No. 7** will provide facility control and status reporting systems, facility control and test instrumentation wiring, cooling water control systems and test data systems.

It is interesting to note at this point during discussion of construction that ASTF will require approximately 63,300 tons of carbon steel and 2,320 tons of stainless steel. Included in these steels as alloys are 24 tons of manganese, .5 tons of phosphorus, 240 tons of chromium, 150 tons of nickel, 7.2 tons of molybdenum, 390 tons of copper, 60 tons of aluminum plus small quantities of silicon and sulfur. The facility will occupy 57 acres of land.

Because this exceptionally large and vital construction and design project has been approved and is now complete, it is a tribute to the vision, sound planning and teamwork of all concerned. Confidence is high that the construction effort will receive the same degree of effort and technical excellence resulting in a product which will be a true national asset without equal in the free world.

C&S

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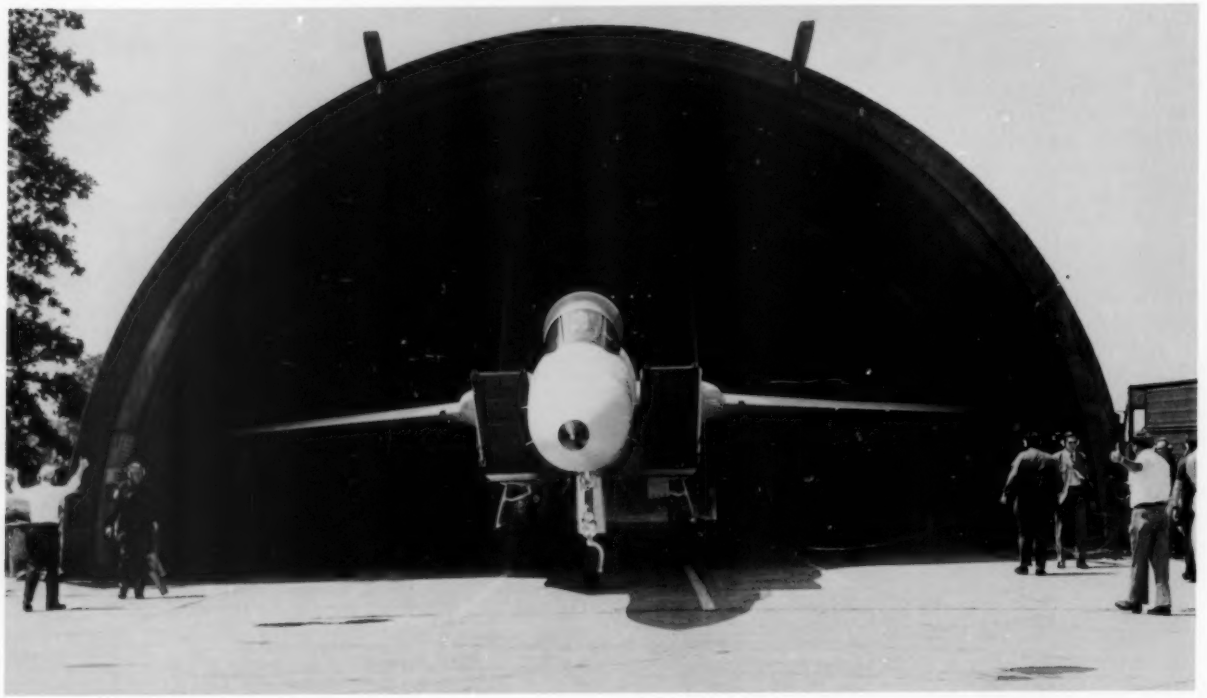
Protection of tactical aircraft has been a recognized requirement by the Armed Forces for many years. When the F-15 was introduced in Europe, various agencies worked together to accomplish a critical project. Here's the story on the teamwork that was evident in

# Meeting an Operational Need

Lt Col Rudolph V. Matalucci, PE



For the first time, an F-15 taxies out of a TAB VEE shelter. Closure and concrete bulkhead closure support are removed.

Physical protection of tactical aircraft on air bases has been a recognized requirement by the Armed Forces of the world for many years. In the past, the lack of adequate protection has caused destruction of aircraft with consequent severe impact on the ready response capability of a nation's air force.

**Theater Air Base Vulnerability (TAB VEE) Shelter**

Since the early 1960s, the Air Force has conducted conventional weapons effects studies on various aircraft shelter configurations. As a result of these studies and full-scale testing, the semicircular steel arch (24 foot radius), covered with a thickness of concrete, evolved as an effective system of aircraft sheltering. The final 100 foot long TAB VEE Shelter configuration included a concrete rear wall with an exhaust port and a "clam-shell" armored steel hinge-mounted front closure, recessed approximately 25 feet under the shelter arch. Construction of these standard TAB VEE shelters began at Air Force bases in Europe in the late 1960s. There are currently over 400 shelters completed.

**Modification Requirement**

The vertical and horizontal clearances between the shelter closure bulkhead and the aircraft wing tips and vertical stabilizer were not sufficient to permit safe operations. The existing exhaust port configuration did not permit adequate engine exhaust exit for normal F-15 operations. Therefore, studies were initiated by US Air Forces in Europe

**Figure 1: This is the front-mounted hinged closure concept. Shaded areas indicate additional steel required. Note additional concrete arch and bulkhead required for the closure support.**

(USAFE) to determine the minimal and most economical shelter modifications to meet operational requirements of the new aircraft.

**Front Closure**

The design of the F-15 necessitated the removal of the existing reinforced concrete bulkhead door support. This need dictated the requirement for a thorough study of all possible front closure configurations and other means for assuring safe operations within the shelter. Numerous alternative proposals were evaluated on the basis of specified criteria, and it was decided to pursue closure concept studies involving both the hinged and rolling/sliding door.

**Hinged Closure:** Under direct contract, USAFE initiated a concept study and design for removing the bulkhead support and repositioning the existing hinged-mounted closure at the front of the shelter face. Two hinged-mounted closure concepts evolved. One consisted of retaining the steel clam-shell configuration and increasing its size to accommodate the shelter opening. The other involved reconfiguring the existing steel clam-shell to an L-shaped planar closure. The first concept was rejected because the door weight increased from 20 to over 30 tons; increased wind forces at the shelter face required a powered opening mechanism which was not feasible to construct, **Figure 1.** Therefore, the effort on the planar closure was pursued to final design. It included a new reinforced concrete bulkhead at the shelter face, door latching and powered opening mechanism. This reconfigured planar door was to be supported by the existing two hinges, **Figure 2.**

The planar door concept used most of the material from the existing clam-shell door. Approximately two tons of additional armored steel plates and miscellaneous parts per leaf were required to complete the new configuration. The shelter closure opening was designed to meet NATO F-15 clearance criteria except at the wing tips where the TAB VEE shelter arch prohibited, in most cases, more than 18 inches of clearance. The concrete bulkhead at the face of the shelter was designed with knock-out panels to facilitate future requirements generated by aircraft geometrics.

**Sliding Closure:** Two front-mounted sliding closure concepts were developed by the Air Force Weapons Laboratory (AWFL). One concept involved a one-piece scaled-down version of the third-generation shelter closure. This concept consisted of a semi-circular 12 inch reinforced concrete wall section supported from forward or rebound overturning by steel out-rigger structural members. The complete door assembly was to be mounted on a number of roller assemblies. Alignment and guidance were provided by two large guide rollers and continuous knife-edge steel plates which move in a recessed groove in the door foundation. The one-piece closure was power operated to allow opening in either direction depending on shelter site conditions, **Figure 3.**

The other sliding concept used the existing TAB VEE clam-shell door in its "prow-shaped" configuration which is mounted on a rigid triangular steel base frame and semi-circular steel bulkhead. The two clam-shell sections were welded together at their interface and at the junction with the steel bulkhead to form a monolithic sliding structure supported by seven roller bearing assemblies.

**"Prow-Shaped" Sliding Closure Prototype:** Following a comprehensive cost and operational evaluation of both the hinge-mounted and sliding closures, the "prow-shaped" closure was selected and presented to SHAPE/NATO (Supreme Headquarters Allied Powers Europe/Northern Atlantic Treaty Organization) for approval. Approval was obtained in September 1975, subject to a prototype demonstration, and a design/construction/direct competitive contract was immediately initiated by USAFE.

During the prototype design, certain door detail refinements were produced to minimize cost, meet NATO criteria, and improve operation, maintenance

**The main landing gear restraint rails are in the "up" position and the aircraft is being winched into the shelter. Note the winch remote control box and cable.**

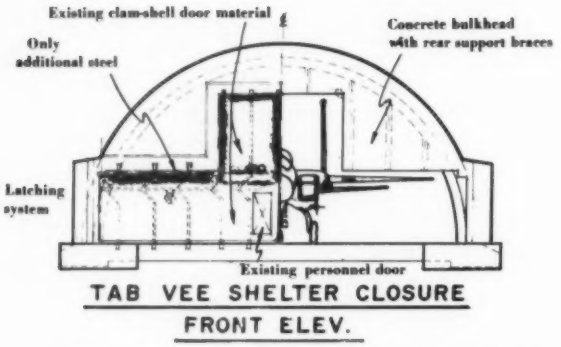



**Figure 2: This is the front-mounted hinged planar closure concept. Heavy shaded area indicates only additional steel required. Concrete bulkhead with braces is permanently attached to shelter arch.**

and safety considerations. The total closure weight, including the bulkhead, base frame, knife edge, door drive rack beam, roller assembly, napalm/blast seal and the 20 ton old clam-shell door, was approximately 50 tons. A 7.5 HP door drive unit contained a turbo-hydraulic coupling for smooth and safe (overload) operations. It was vertically mounted, and a 90 degree gear box transferred the drive force through a pinion gear to a low horizontally mounted door rack beam. In the event of power failure, disengagement is possible by hydraulic jacking the drive unit from the door rack beam and opening the door with a ground vehicle by a pulley and cable arrangement.

Construction of the prototype closure was completed at Bitburg AB, Germany, and was tested in March 1976. Over 100 opening/closing test cycles were conducted. Final adjustments were made to the prototype and the production design. A successful demonstration for SHAPE/NATO was conducted in May 1976, and approval was obtained to proceed with production contracting.

**Exhaust Port**

Preliminary operational exhaust port tests were conducted in an unmodified TAB VEE shelter with an F-15. These tests revealed that the port opening was not configured to permit exit flow of engine exhaust. Severe blow back occurred which increased the temperatures inside the rear portion of the shelter to levels not acceptable to the aircraft tail structure. High levels of carbon dioxide recirculation further raised concern about exhaust ingestion through the aircraft engine intakes. In addition, carbon dioxide in the rear area of the shelter reached levels that were found to be harmful to ground personnel. As a result of the findings, the then 4th Medical Services Squadron (4 MSS) from Wiesbaden AB conducted scale model tests and recommended exhaust configurations for further testing. Aeronautical Systems Division (ASD) provided additional guidance and recommendations through a McDonnell-Douglass (McAIR) contract effort for other modifications to the exhaust port. All concepts were technically evaluated and certain ones were selected for prototype testing. The concepts ranged from complete demolition of existing ports and construction of the 3rd-generation tapered tunnel configuration, to the removal of only sections of existing ports and installing deflector sections.

After a long series of F-15 operational tests during April-June 1975 on seven different port modifications, the aperture plate configuration proposed by the 4 MSS was determined to provide the most efficient exhaust flow characteristics at a minimal cost without affecting aircraft physical protection requirements. The modification consists of increasing the vertical opening of the port by one meter and installing a structurally reinforced steel plate at the port opening to form an oval aperture which coincides with the plume profile of the F-15 exhaust. The exterior concrete walls of the exhaust port were raised one meter to compensate for the one meter of protective concrete curtain wall removed.

The F-15 exhaust centerline height is approximately eight feet and its direction is practically horizontal. By contrast, the F-4 exhaust centerline is lower and directed somewhat downward from the horizontal. During the exhaust port study, tests were also conducted with an F-4 to determine reconversion problems after an aperture plate was installed for F-15 operations. It was found that only the lower part of the plate needed to be removed for F-4 operations. Therefore, this section is hinge-mounted to the floor to permit rapid exhaust port conversion for flexibility in operational requirements.

Final USAFE F-15 prototype exhaust port demonstration tests for SHAPE/NATO were conducted in January 1976 at Bitburg AB and the configuration was approved as a functionally and economically acceptable system modification. Over $10,000 per shelter will be saved by NATO from the modification developed by USAFE and which was incorporated into the production contract.

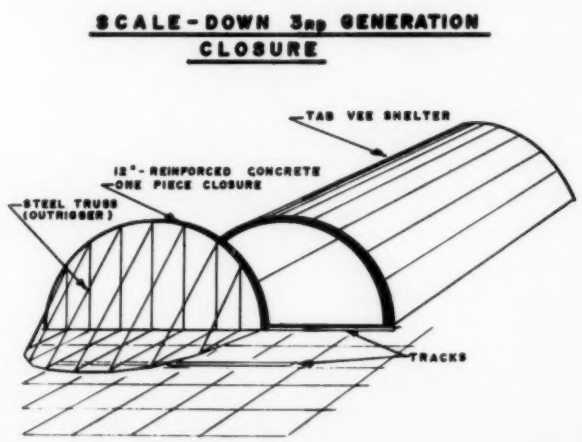



**Figure 3: Scaled-down third generation closure concept.**

**Prototype "prow-shaped" shelter closure at Bitburg AB, Germany. Note the vertically mounted drive mechanism and steel arch for napalm/blast seal. The interior closure cavity has a personnel catwalk for shelter access.**

**Floor-Mounted Aircraft Tracking/Guidance System**

A field survey was conducted at Bitburg AB to determine existing interior shelter dimensions. From this data, it was found that the minimum F-15 wing tip clearance was 12 inches after the recessed door concrete collars were removed. (The average wing tip clearance of the 72 shelters surveyed was approximately 15 inches.) This condition raised many concerns relative to backing aircraft into shelters using ground vehicles and exiting under engine thrust. The high cost of repairing damaged wing tips further highlighted the need to develop aircraft tracking/guidance concepts for installation in TAB VEE shelters.

At USAFE request, ASD contracted with McAIR to develop tracking/guidance system concepts which could be evaluated by USAFE for operational adequacy. At a June 1975 meeting at USAFE, seven concepts were presented by ASD/McAIR and four were selected for prototype testing. Competitive contract action was immediately initiated by USAFE to design and construct the four selected systems in a shelter at Bitburg AB for testing and evaluation. During December 1975, construction and installation of a floor-mounted two-speed aircraft winch, two main landing gear restraint floor-mounted "tilt-up" rails, an adjustable nose steering bar with friction brake, and a nose wheel skate assembly guided by two centerline floor rails were completed and initially tested using dummy loads to simulate aircraft weight.

The remote control winch system was designed to pull the aircraft, pre-positioned on the apron, into the shelter backward while the operator used the nose steering bar to maneuver the aircraft. The winch control button was mounted in the hand grip of the nose steering bar for ease of operation. When the operator wished to stop the aircraft movement, the winch control button was depressed to "off" position and braking action was applied to the wearing surface of the nose wheel by pushing downward on the steering bar. A sufficient mechanical advantage was provided by the lever arm which actuated a series of linkages and pressed the friction pad of the brake shoe to the nose wheel.

To establish positive lateral limits so that the possibility of damage to a wing tip is almost eliminated, the main landing gear was restrained by two continuous lengths of hinge-mounted steel plates on the shelter floor. These were designed to be placed in the upward position only during the aircraft insertion maneuver. These restraints can withstand a reasonable main landing gear impact force and were sized approximately six inches in height to prevent inadvertent aircraft override. An electrical heating element and drainage were provided in the recessed floor channel support to prevent freezing conditions. The main gear restraints were installed from the wheel blocks at the rear of the shelter to a distance outside on the apron where the main gear is located before the wing tips reach the shelter entrance.

To assure proper alignment during power exit, a nose wheel skate was developed and constructed to travel approximately three inches high on two small gauge rails imbedded in the concrete floor. The nose wheel was loaded on the skate inside the shelter during its last few feet of travel. The aircraft would remain in that position until exiting, at which time the nose wheel would ride continuously on the skate for the required guidance inside the shelter. Nose wheel skate bumper stops would be raised outside on the apron at the "wing-tip clear" point, and the nose wheel would then ride down the skate ramp onto the apron pavement and to a taxiway.

All of these systems were tested extensively in January 1976 with an F-15. Repetitive sub-system and component tests were conducted with F-15 SPO

**The adjustable prototype nose steering bar is attached to the nose wheel. The aircraft is pre-positioned on the apron prior to attaching winch cable to main gear struts for shelter insertion.**

(System Program Office) and Base Operational Maintenance crews to optimize technical design and safety measures. Base ground crew skills in aircraft maneuvering were also applied for determining system specifications and operational procedures. At the completion of these technical tests and system adjustments, a USAFE staff and Command operational demonstration was conducted, and it was decided to use the main landing gear restraint/nose wheel steering bar and winch for shelter ingress. Only centerline floor markings were found necessary for egress under aircraft power. The nose wheel skate system was deleted for safety and other operational reasons. These selected systems were demonstrated to SHAPE/-NATO and approval was obtained to finalize the standard design for production contract.

**Schedule**

The TAB VEE shelter modification program to meet deployment of the F-15 to Bitburg AB involved numerous development phases, several significant Command decision points, considerable coordination between aircraft manufacturer, ASD/-F-15 SPO, USAFE staff, SHAPE/NATO and German Ministry of Defense (MOD) agencies, and a dedicated active prototype testing and evaluation program. From January 1975 (when the magnitude of the modification requirements was clearly identified) through July 1976 (when a production contract award was achieved), a compressed milestone schedule had to be adhered to strictly at all levels of management.

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At the outset, USAFE decided to actively participate in concept development of the front closure, tracking/guidance system and rear exhaust port modifications. At the completion of each development, direct contract action was initiated by USAFE to design and construct prototype systems for testing and evaluation. Concurrent with prototype design, the German MOD was tasked through NATO to commence site adaptation design for 72 shelter modifications. Pre-final system standard designs were submitted to the German design agency immediately following prototype testing for review, approval and incorporation into the construction contract. Final design modifications were submitted for each of the systems as soon as the details were made available from the prototype contractors. Following the most accelerated contracting actions, advertisement under International Competitive Bidding procedures was initiated in June 1976. Bids were opened in July 1976 and the contract was awarded in the same month.

**Summary**

The contract package included all the required TAB VEE modifications to accommodate the F-15, such as the prow-shaped sliding (rolling) closure, exhaust port reconfiguration and tracking/guidance systems, as well as providing additional turning apron area at each shelter and facility relocation, as necessary. In addition, other NATO eligible construction items were combined in the contract which included interior shelter lighting, hinged exhaust port steel lids (blast covers), AGE receptacles from exterior equipment pads through shelter wall, thickening of the rear wall from 12 to 18 inches, and a shelter ventilation system for aircraft maintenance crews. The total German MOD estimated cost reached $14 million for the entire TAB VEE shelter conversion contract.

The concerted effort that was expended on the entire modification program for the F-15 was a remarkable example of the cooperative spirit that can be harnessed to meet an urgent military requirement. During the initial study of the problems to be encountered in the TAB VEE shelter modification program, careful planning, scheduling, and management attention were focused on the integration of concept development, prototype design, construction and testing, and production design and contracting to meet an ultimate deployment schedule. It was equally vital to this entirely NATO-funded shelter conversion program that SHAPE/NATO support was confirmed each step of the way and by the appropriate authority. The prompt response and willing support and participation from the Air Force, SHAPE, NATO, and German governmental agencies contributed immeasurably to the successful achievement of a critical USAFE project. E&S

*Directorate of Engineering and Services*

# Current Emphasis

*brief commentary on significant developments*

UTILITIES CONSERVATION EFFORTS--Worldwide conservation efforts by installation energy managers during the transition quarter--FY 7T--resulted in a 5.8% reduction compared to the same FY 75 time frame. This effort equates to an equivalent fuel oil savings of 18 million gallons for a cost avoidance of about $6 million.

SOLAR ENERGY MFH PROJECT--An ERDA funded solar energy demonstration project has been awarded at Sheppard AFB, Texas. This first of five FY 76 ERDA projects at Air Force installations will use solar energy to satisfy approximately 70% of the domestic hot water and environmental heat requirements in four MFH four-bedroom units. Collectors will be mounted on the carports and will be of the fixed, adjustable tilt and tilt reflector configurations.

MBO GOALS FOR DESIGN AND CONSTRUCTION OF MCPs--USAF/PREE ALMAJCOM letter dated 8 Nov 76 established design and construction execution goals for FY 77, FY 78 and FY 79 Military Construction Programs. All FY 78 MCP projects should have been well under design (35% stage) at the time of MCP presentation to Congress (Jan 77). Accurate and timely inputs to the RCS: PRE(AR) 7124 report are essential for proper management.

REIMBURSABLE SERVICE CHARGES FOR VOQ/VAQ--Effective 1 Oct 76, the rates established should cover direct operating expenses, fair share of administrative expense, depreciation and desired improvements. They must not exceed $4 per day. Since reimbursable charges result in expenditure of appropriated funds, the rate charged is critical in keeping this expense as low as possible.

FAST PAYBACK CAPITAL INVESTMENTS (FASCAP) PROGRAM--As part of the Air Force Productivity Program, $6.5 million has been made available Air Force-wide for FY 77 to finance Fast-Payback Capital Investments that can be amortized within two years by reductions in O&M manpower costs. The program represents a means of funding work method improvements that, in the past have had difficulty in competing for funds with higher priority mission equipment. To qualify, equipment must be available for immediate acquisition (requiring no further design, testing or modification) and not require an extensive phase-in period. Servicing Management Engineering Detachments will provide further criteria and assistance in submitting FASCAP proposals.

DURABLE PRESS FATIGUES--The Air Force Uniform Board has recommended adoption of the Army proposed durable press fatigues as a replacement for the current cotton sateen fatigues as a result of a standardization action. It is expected that OSD will approve the durable press fatigues.

STUDY OF STATIC ELECTRICITY GENERATION IN FUEL DISPENSING FACILITIES--confirms the need for special precautions in filling empty filter separator vessels after installation of new elements due to high initial charging tendency. Slow filling during the air bleed period, preferably by gravity, is considered essential to preclude possible vapor space discharge.

OFFERS OF REAL PROPERTY--All gifts of real property (land, buildings, fixed improvements, utilities and other permanent-type additions to (continued next page)

land) must be submitted in accordance with AFR 11-26 through the Command civil engineer to AF/PRER and be accompanied by an environmental assessment.

NAF PROGRAMMING--Functional design of MWR projects is receiving top priority during early project development and review stages. Funding authorities (AFWB, HQ AFCOMS, etc) are basing decisions on not only scope and cost, but functionality as well. Managers should insure that all functional elements of MWR facilities are considered prior to submittal to higher authority for funding and project approval.

INSTALLED FIRE PROTECTION SYSTEMS COURSE--Action has been initiated by the Fire Protection Training School at Chanute AFB to delete this course, 3AZR57150-9, effective 1 July 1977. Effective 1 October 1977, this training will be incorporated into Course 3AZR57170, Fire Prevention Technician, and one additional week will be added making the course five weeks in length.

EARTHQUAKE DESIGN FORCES--AF/PREE letter, 4 November 1976,"Minimum Lateral Earthquake Design Forces," updates provisions of AFM 88-3, Chapter 13, "Seismic Design for Buildings." Criteria revision includes use of the 1976 Uniform Building Code in conjunction with AFM 88-3, Chapter 13, when the magnitude of seismic lateral forces is to be determined.

ENERGY RECOVERY CONCEPT--The Air Force Civil Engineering Center has developed a system to burn a waste POL/conventional fuel mixture as a supplementary fuel in heating plant boilers. An AF/PRE letter of 26 November 1976 endorses this energy recovery concept and provides technical and operational criteria.

FOOD SERVICE CONTRACT GUIDE--The revised Guide (AFP 146-14), now in print, includes many new aids for the Food Service Technical Representative of the Contracting Officer (TRCO). Included are new guidance on writing statements of work for food service contracts, making a meal estimate and a checklist for TRCOs.

RECOMMEND DISCONTINUED USE--of A.O. Smith "Static Charge Reducers" in fuel handling/dispensing operations because of delayed functioning during start-up. Non-performance can result from improper maintenance.

TRAINING FACILITY REQUIREMENTS--More accurate identification of training facility assets and requirements will result from the assignment of space from seven unsuitable codes to nine new codes: six standard, three command-unique. New criteria for standard facilities appear in Change 3 to AFM 86-2.

PRIME BEEF TRAINING--AF/CEC's Prime BEEF evaluations this year have shown a definite need for all units to review their in-house unit training for contingency skills. Individuals, as well as commanders and team chiefs, must realize the military CE's reason for being is not the need to perform base maintenance, but because of the requirement to respond effectively to contingency situations. All Prime BEEF members must have a dual goal: the improvement of their individual skills and the organization's capability to operate in a contingency environment.

HYDRAULIC CRANE--TA 010 authorizes a 15-ton hydraulic crane for general BCE use. This crane comes with hydraulic clam shell and a work platform which will put two men to a 70 foot working height. BCEs should consider changing their authorizations to this more modern piece of equipment.

GUIDANCE ON OIL SEPARATORS--Design data and guidance have been expanded on oil separators and fuel spill collection facilities in Change 3, para 11-14, AFM 88-15.

**Motivation has been a topic of research and theories for years. Many experts have conflicting theories. Some interesting observations are presented in the following to assist you as a manager on**

# How to Manage Motivation

by James P. Lowsley, Jr, EIT

How many of us have asked ourselves the question, "How can I get my unit to **want** to do what I desire it to do?" In other words, "How can I motivate the people in my unit?" or "What management 'style' will work for me?"

Motivation has been a topic of considerable research and theories for several years. Many experts who have attempted to answer these questions have conflicting theories on the subject. Some examples by these experts include:

● Elton Mayo, with F. P. Roethlisberger and W. J. Dickson, conducted studies in a Western Electric plant near Chicago from 1924 to 1932. These studies became the well-known "Hawthorne Experiment." Productivity was measured as working conditions were made better and, then again, when improvements were lessened. Strangely, productivity continued to improve even though lighting, rest, lunch period and other working conditions were reduced or made less attractive. It was established that the experiment itself was the cause of the increased productivity. In the process of experimenting, attention was lavished on the workers. Quite by accident, human needs (such as feeling respected, important, competent and growing) were satisfied as tasks, work processes and work flows were changed. Mayo's work at Hawthorne is described in **Management and the Worker** by Roethlisberger and Dickson. Through that book, managers were made aware that workers need **two** incomes to do their best. The financial income is not enough—the psychological income must also be provided.

● Abraham Maslow's **Hierarchy of Human Needs** is the base upon which most modern motivation theory is built. Man moves up in the hierarchy from a foundation of physical needs to safety (security), social (belonging), esteem (what others think of him), perhaps finally to some kind of self-actualization (feeling that he is making the most of himself). Physical-Safety-Social-Esteem-Self-Actualization. Once an individual has, in his own eyes, satisfied a need, that need no longer is a motivator for him.

● Chris Argyris who wrote **Integrating the Individual and the Organization** plus many other books and articles, theorizes that people develop in seven ways:

1. **Passive to active.**
2. **Dependent to independent.**
3. **Few ways of behaving to many ways.**
4. **Shallow interests to deep, strong interests.**
5. **Short time perspective to careful consideration of past and future.**
6. **Subordinate role to equal or superior role.**
7. **Unaware of self to aware and in control of self.**

Argyris believes these developmental channels are blocked in many organizations. The blocking creates frustrations that result in apathy, absenteeism and other counter-productive behaviors.

● Frederick Herzberg's book, **Work and the Nature of Man,** introduced a motivation-hygiene theory in 1966. His research indicates that two different sets of needs are involved in motivating. Herzberg's "motivation" needs are directly related to man's tasks. They are challenging work, achievement, recognition, responsibility and growth.

● Douglas M. McGregor wrote **The Human Side of Enterprise,** which is a favorite in both management and academic circles. His theories, "Theory X and Theory Y," offer two different assumptions concerning men and work.

| Theory X | Theory Y |
|---|---|
| **1. Work is inherently distasteful to most people.** | **1. Work is as natural as play, if the conditions are favorable.** |
| **2. Most people are not ambitious, have little desire for responsibility, and prefer to be directed.** | **2. Self-control is often indispensable in organizational goals.** |
| **3. Most people have little capacity for creativity in solving organizational problems.** | **3. The capacity for creativity in solving organizational problems is widely distributed in the population.** |
| **4. Motivation only occurs at the physiological and security levels.** | **4. Motivation occurs at all levels of Maslow's Hierarchy of human needs.** |
| **5. Most people must be closely controlled and often coerced to achieve organizational objectives.** | **5. People can be self-directed and creative at work if properly motivated.** |

● David C. McClelland of Harvard University is concerned with achievers or self-motivators. His research indicates that approximately 10 percent of the US population can be called achievers. He theorizes that the achievement drive is a "learned motiva-

tion"—not something one is born with—and is best learned on a job where one:

- Can assume more responsibility.
- Participates in goal setting.
- Establishes high, but not "impossible" goals.
- Gets fast, clearcut feedback.
- Gets frank, detailed performance evaluations.
- Robert R. Blake and Jane S. Mouton developed and described **The Managerial Grid** in their 1964 book. The grid relates two factors: the leader's concern for production, and his concern for people. The horizontal axis of the grid represents increasing levels of concern for production on a scale from one to nine. Using the same scale, the vertical axis represents increasing levels of concern for people. A "9-1" manager is production oriented; "1-9" is people oriented; "9-9" is maximum concern for both people and production, and most managers fall into the "5-5" or middle-of-the-road style. The "9-9" manager relates to McGregor's Theory Y assumptions while both the "9-1" and "1-9" managers relate to McGregor's Theory X assumptions.
- Rensis Likert studied five factors: leadership, motivation, decision making, communication and control. He states that these factors interact to form a continuum of management styles and can be described as systems one through four. System one is much like McGregor's "Theory X" (low trust), while system four is much like McGregor's "Theory Y," which is based on trust. Likert found that the closer the management style of an organization approaches system four, the more likely it is to have a continuous record of high productivity.

From the foregoing, it seems clear that the management style which satisfies both man's physiological and psychological needs will be most successful. It seems that we must be able to stimulate the motivation which comes from within an employee, not that which is generated externally by the manager.

Let us look at some management myths which destroy the internal motivation of man rather than generate it. The first is called the Paycheck Myth, or "All they want is the dollar." Money does not have a sustaining effect of motivating a person's performance; its effect is hygienic as indicated by Frederick Herzberg. Wages prevent job dissatisfaction. However, low dissatisfaction with a job situation represents tolerance and is **not** the same as job satisfaction or a sense of achievement.

Another myth is the External Stimulation-Motivation Myth. A manager who depends on this myth begins with personal favor and personality approaches which soon fail. Therefore, a retrograde movement is made and an attempt is made on a competitive basis (one unit against another). When all else fails, this manager will exercise authority from a stance of power and threaten. Fear may bring conformance but not performance.

The third myth to discuss is the Accountability Myth. A manager who depends on this myth believes that employees do not want responsibility. Therefore, he may not only ask a staff member to prepare a staff study concerning a particular problem, but also tell him specifically what facts to consider, what each means, how to write the study, what conclusions are to be made, and what recommendations are to be made.

There are additional methods used by managers to destroy motivation in employees. These include making an assignment which lacks usefulness; not showing job appreciation; using humiliation or group embarrassment. Still another, is to project a lack of confidence in a person thinking that this will be an impetus to motivate him. (It will, in reverse!) Treating a person as "less than he is" creates a punishment climate and results in apathy.

It is better for a manager to continually build and to surround employees with a climate for excellence, and a feeling that productive and relevant work is accomplished. Individuals **need** to feel important.

Managers can instill a sense of job and personal importance in an employee by being receptive. By being receptive the manager allows the employee to impart influence upward, sideways and downward. Allowing an employee to influence upward means that the manager is receptive to employee suggestions and innovations. The manager **must listen intently,** which is an indication of the importance he gives to the employee as an individual and to his ideas.

The manager allows the employee to influence sideways by giving the employee "free rein" to deal with other organizations without requiring detailed briefings back to him, etc.

The downward influence a manager should allow employees is to allow subordinates to manage their own resources without interference. Not only is this vital to his own supervisory effectiveness and self-importance, but also it is necessary for him to gain respect from his own staff.

In conclusion, as managers, we should **manage motivation** through the internal sensitivities of employees. We must stimulate the motivation which comes from within an employee, not that which is generated externally by us. We cannot really motivate employees; it is the need in the hierarchy of needs which motivates employees. We must determine what need each employee is attempting to fulfill and tailor our management technique to aid in fulfilling that need. E&S

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## Here is an example of how the Air Force improved the operations of its clothing stores and still provided the proper level of service required.

# Increasing Efficiency While Maintaining Support

by Maj Ervin J. Koenig

A major change affecting the area of responsibility within Services occurred in December 1975 when the Department of Defense (DOD) approved the Air Force request to transfer operation of its military clothing sales stores to the Army and Air Force Exchange Service (AAFES).

The decision for this request was not made overnight. It was based on an extensive study and test operation of four clothing sales stores (MacDill AFB, Eglin AFB, Scott AFB and McConnell AFB) by AAFES from July 1973 through June 1974. The results of the study and tests proved conclusively that the AAFES cost of operation was much less than the Air Force costs and would result in a savings to the Air Force of over a million dollars per year.

Following approval, the Air Force and AAFES began formalizing a Memorandum of Understanding (MOU) covering all aspects of the AAFES clothing store operation. Once the memorandum was signed in February 1976, AAFES began assuming operational control of the stores in March and the transfer was completed on 30 June when the last of the 123 stores was turned over.

That final transfer culminated a story that goes back 20 years, for it was in 1956 when AAFES was first approached by the Air Force concerning such a proposal. The proposal was presented to the AAFES Board of Directors on 30 April 1957 and the Board voted not to endorse the proposed takeover. The reasoning being that AAFES should not become involved in the operation of commercial type, appropriated fund activities. In 1958, the Air Force again proposed that AAFES operate clothing sales stores; however, the AAFES Board of Directors rejected the proposal reiterating their previous position. On 9 December 1970, the Board of Directors considered a proposal by PACAF/-PACEX that the exchange operate the Hickam AFB clothing sales store on a one-year test basis. This time, the Board voted to approve the proposal subject to approval of a detailed operations plan by both departments and favorable advisory opinion by the General Accounting Office (GAO). A concept of operations was Air Staffed and disapproved based upon the Judge Advocate General objection to replacing the management of the military service with the management function of a nonappropriated fund without the express permission of the Congress. As a result of the Judge Advocate General's opinion, the PACAF representatives on the AAFES Board of Directors withdrew the proposal.

The most obvious question now is: "After all of the unsuccessful attempts, how did the present operation become acceptable?" The current system got off the ground when the Chairman of the AAFES Board of Directors requested in September 1972 that AAFES conduct a study on the feasibility and desirability of AAFES assuming responsibility for the operation and supervision of Army and Air Force military clothing sales stores. The AAFES study concluded that it was feasible and recommended test operations be conducted at two Army installations (this was later expanded to four Army and four Air Force installations). A joint Army, Air Force and AAFES task group was formulated which then established the ground rules for the test operation. As mentioned earlier, these tests were concluded in June 1974. At that time, the Army determined the AAFES system would not be compatible with their method of operation and withdrew from any further consideration. The Air

Force, however, after thoroughly evaluating the test results, concluded that AAFES operation was feasible, legal and beneficial to both the Air Force and the clothing sales stores' patrons. Therefore, approval of the DOD was formally requested in December 1974. After satisfactorily answering a number of questions posed by the DOD Comptroller, the Air Force received final approval for the transfer.

That pretty well brings the reader up-to-date on the "what, where and when" of the transfer but leaves unanswered the "why." Put another way: Why was the Air Force convinced that the transfer of operations of the clothing sales stores to AAFES was the proper decision?

First, there was an obvious cost savings. Direct operating costs for in-house operation averaged slightly over 25 cents for every $1 of sales while AAFES operating costs averaged slightly under 18 cents per $1 sales. This adds up to over a million dollars a year in direct dollar savings to the Air Force. Another important consideration which influenced the decision was the reduction in manpower authorizations associated with the transfer. A total of 516 spaces were deleted and, under the current requirements for austere manning, were welcomed reductions.

The customer is also expected to reap benefits from the transfer. Since the Exchange procured uniform items and the Defense Personnel Support Center (DPSC) procured items are now side-by-side, the customer is afforded the opportunity for real one stop comparison shopping. Additionally, it is expected that the hours of operation will be compatible with the Exchange operating hours, thus providing increased hours for shopping.

Now that the "whys and wherefores" leading up to the decision to transfer the stores to AAFES have been explored, the details involved in the actual responsibilities of AAFES and the Air Force, as provided in the MOU are considered appropriate for discussion. First of all, the MOU stated that the inventory of clothing items on hand, on order and due in at the time each store was transferred would be assumed by AAFES under an agent concept, i.e., AAFES would serve as an agent of the Air Force regarding the clothing inventory. After all clothing sales stores are transferred, the total dollar value of the inventory transferred to AAFES would be carried on the Air Force Stock Fund records as "inventory with agent." The monetary value of the inventory with agent may be changed only as a result of annual price changes or other reasons mutually agreed to by both parties.

The MOU carries the provision that AAFES would order uniform clothing items from the DPSC, citing nonappropriated funds on the requisitions. Clothing items from DPSC will be sold at the standard price established by DPSC (just as they were under Air Force operation) and the selling price will not include a markup for personnel salaries or other AAFES operating costs. At the same time, AAFES is allowed to sell Exchange merchandise in the clothing store along with the DPSC procured merchandise.

In accordance with the MOU, the Air Force agreed to pay AAFES for all operating costs incurred incident to the sale of DPSC procured merchandise. AAFES is to submit monthly billings for operating expenses incurred to the Air Force Accounting and Finance Center for payment. Initially, payments will be made based on 18 percent of the dollar sales of DPSC items. Each year the adequacy of this reimbursement rate will be re-examined and adjusted if necessary to insure reimbursement of actual operating costs incurred. In addition, the MOU stated that the facilities used by the Air Force to house the clothing store operation would be made available to AAFES and the equipment items (typewriters, cash registers, etc.) would be transferred to AAFES on a custody receipt account with title remaining with the Air Force.

During the negotiating stage, individual Base Civil Engineers and Exchange managers conducted surveys of the Clothing Sales Stores to determine necessary modification/renovation requirements to bring the stores up to Air Force standards. Over $3.0 million in deficiencies were identified. As a result, the Air Force was obligated to provide the required funding for these projects in FY 1977. Much of the work is being accomplished now and should provide much needed improved facilities.

That just about sums up the story of the transfer of clothing sales stores to AAFES except for one footnote. The Navy immediately followed the Air Force and transferred their clothing sales stores to the Navy Exchange. The Army has reversed its former position and is now negotiating with the Exchange Service on the transfer of its clothing sales stores to AAFES.

The transfer of Air Force clothing sales stores to AAFES is one example of how the Air Force can improve the efficiency of operation and still provide the proper level of service required. There may be other areas which can be operated more efficiently and Air Force managers should constantly evaluate operating methods with a view toward increasing efficiency while maintaining proper support. E&S

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The Air Force designer now has the opportunity to look at how installations are being used, observe the problems and aspirations of personnel, and judge the validity of his original design assumptions. The objective is . . .

# Maximizing Total Satisfaction of Air Force People

by 1st Lt Theodore T. Shierk, RLA

Comprehensive planning represents the "state-of-the-art" in land use allocation/design. The system, from its origin in the mid-1960s, has proven to be a dynamic methodology, continually striving to better relate man with his physical environment. Beginning in October 1973 with the Air Installation Compatible Use Zone (AICUZ) program, the Air Force has undertaken an aggressive plan to improve the environmental master planning system.

An important advancement in Air Force comprehensive planning came on 14 April 1975 (later to be updated by a Tab A-1 Phase II requirement on 11 September 1975). At that time, the Directorate of Engineering and Services, Headquarters US Air Force released the comprehensive plan (formerly master plan) submittal together with the Tab A-1 environmental narrative. This created an excellent reference source while expanding Air Force planning in scope and refinement. The PRE letter of 14 April 1975 explains that:

**"The Air Force Master Plan traditionally focused on the physical layout and development of on-base facilities and services. The comprehensive plan, in addition to the focus on traditional master planning, incorporates in-depth analyses of the interrelationship between: (a) natural and man-made environments; (b) the social characteristics and needs of people; and (c) the dependencies between air bases and surrounding communities."**

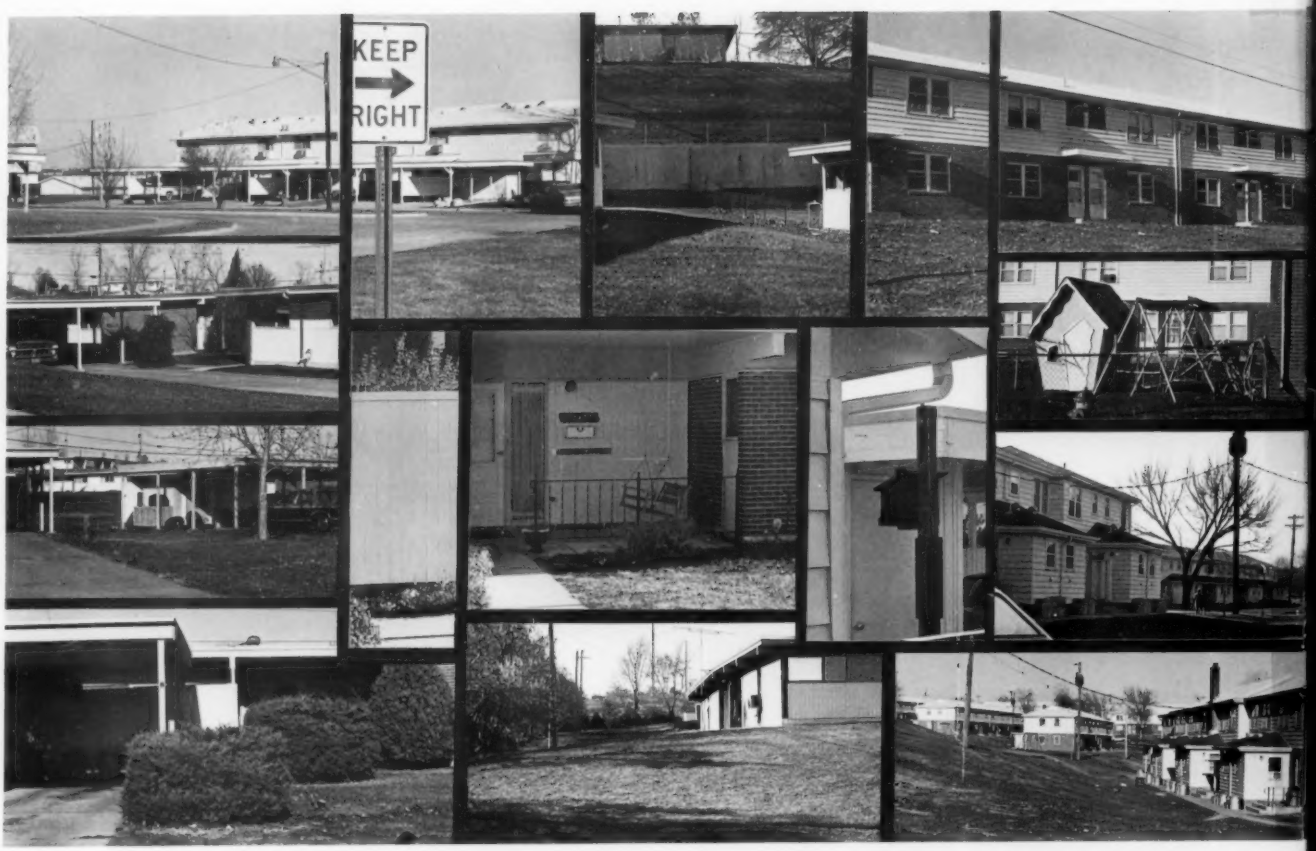
Numerous planning aspects including environmental assessments, total community center concepts, the AICUZ program and base landscaping plans are receiving worthwhile consideration as part of the entire comprehensive planning system. Another important, but less mentioned, aspect of comprehensive planning is a consideration of the needs and feelings of people who work and/or live on a given base (functional aesthetics and livability, or "people planning"). The Air Force designer now has the opportunity to look at how installations are being used, observe the problems and aspirations of personnel, and judge the validity of his (the designer's) original design assumptions. The objective is to maximize total satisfaction of Air Force personnel and dependents.

Today's Air Force encompasses a wide variety of people of all ages from many varied backgrounds. The problems created by designers failing to realistically address themselves to these sometimes subtle differences have already come to light within the Air Force organization. For example:

- The transition of minority groups into the Air Force can be more difficult than anticipated.
- Frequently uprooted teenagers, both military and dependents, have not always had every opportunity to meet friends through athletics, hobbies and appropriate social activities. Although we cannot change the fact that drugs and alcohol are easily accessible to today's young people, designers can provide teens with better recreational alternatives than now exist.
- Retaining qualified personnel is an Air Force-wide objective; providing a desirable living/working environment at Air Force bases is a vital contribution to this end. Many important and diverse land use functions are available for study on the air base. This article is intended to present some existing people-oriented design material as it relates to the base housing area. Hopefully, the designer/planner will use this material as the stimulant to further his interest in people planning.

**Housing Area**

The arrangement of base housing units should




**Outdoor space is too valuable to be treated as an awkward leftover of the housing plan**

be viewed as a fluid design challenge rather than a repetition of the conventional "grid iron" pattern. The satisfaction of the user can hinge on the use of a variety of natural slopes and unit elevations, the orientation of the dwelling unit and the preservation of natural vegetation.

Clustering dwelling units has long been a standard Air Force procedure for economic reasons. The clustering practice also has a sound sociological basis. Clare C. Cooper, a professor in social and psychological factors of design at the University of California, emphasizes that clusters around open play areas should vary between 20 and 100 family dwellings. This criteria should insure an optimum sense of neighborhood identity for the user without unnecessarily limiting his choice of friends. Ms Cooper also notes that dwelling units should be arranged so that contact with neighbors is optional, neither difficult nor inescapable because of building design or directional orientation.

**Outdoor Space**

Successful Air Force housing must be specifically designed for the Air Force family; in addition to a shelter, the family requires outdo
Air Force planners have traditionally t
account the need for a safe outdoor play
other aspect that must be considered is the
to clearly define as well as provide both pr
common open space. Many social/psycho
vestigators, including Oscar Newman (
Professor of City Planning at New Yor
sity), Edward Hall (Professor of Anthro
Northwestern University), and William
(Associate Professor of Sociology at the U
of Toronto), have discovered that famili
show a great enthusiasm for having s
space of their own attached to their dwel
areas should be bounded clearly so there
fusion as to where private space ends an
space begins. The Air Force designer must
ize that common open space is a supplem
a replacement of, private open space. M
and Dr Suzanna Keller (Professor of So
Princeton University) add that common o
is also a vehicle to establishing and m
neighborhood rapport. By implementing th
the planner will find that many other go

outdoor space.
nally taken into
r play area. An-
l is the necessity
both private and
psychological in-
man (Associate
w York Univer-
Anthropology at
illiam Michelson
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families usually
ving some open
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pplement to, not
ace. Ms Cooper
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mon open space
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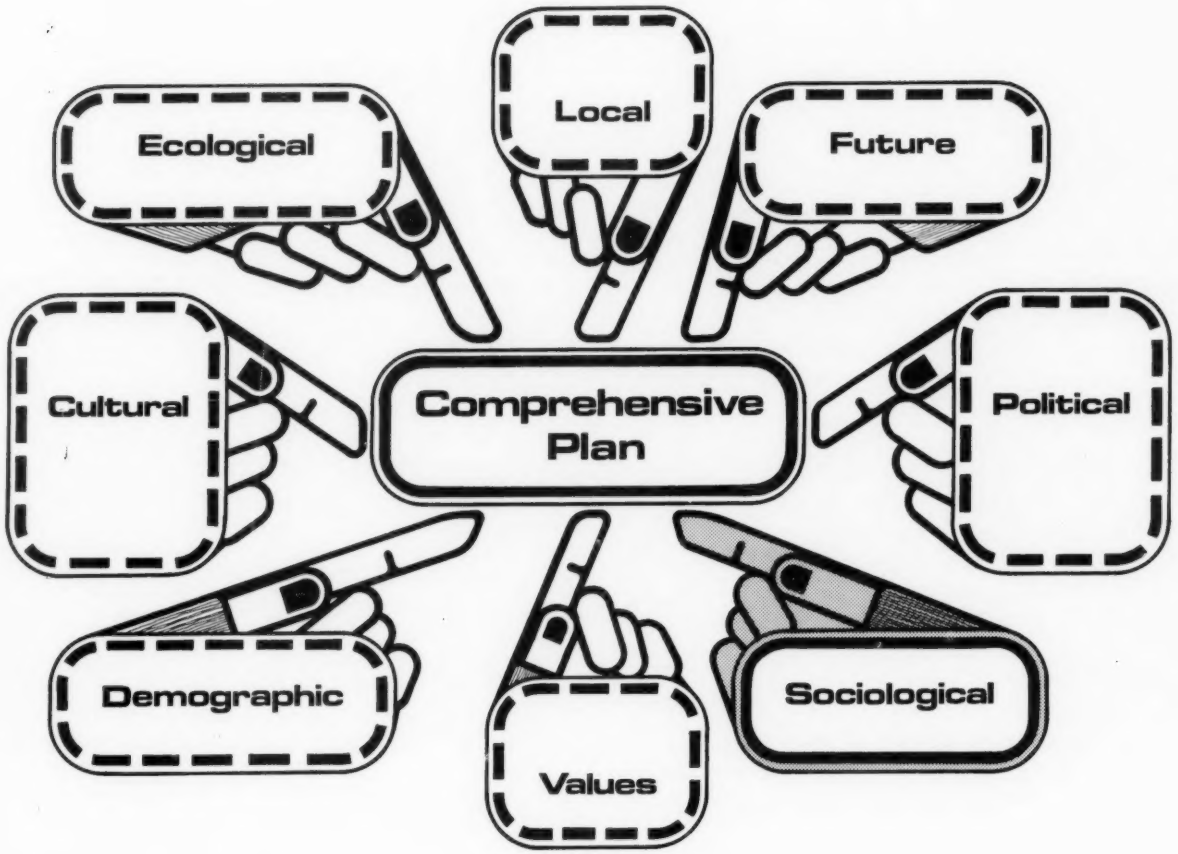



## Air Force Comprehensive Planning

THE OUTLINE SHOWS MAJOR DATA AREAS USED TO DEVELOP A COMPREHENSIVE PLAN. ALTHOUGH SOME ASPECTS APPLY PRIMARILY TO AN AICUZ OR LARGER PLANNING AREA ( INVOLVING CIVILIAN AND MILITARY INTEREST ), THE APPLICABILITY OF THE SYSTEM WITHIN BASE BOUNDARIES SHOULD NOT BE IGNORED.

**Ecological** CONSIDERS SOIL TYPES, SLOPES, HYDROLOGY, VEGETATION AND OTHER ENVIRONMENTAL MATERIAL.

**Cultural** INVOLVES UTILITIES ( SEWER LINES, ELECTRICAL DISTRIBUTION SYSTEMS, ETC. ), HISTORICAL AREAS, EXISTING LAND USES AND SIMILAR DATA.

**Demographic** DOCUMENTS HEALTH STATISTICS, CENSUS DATA, ECONOMIC MATERIAL AND RELATED FACTORS

**Values** INCLUDES BASE MISSION AND PRIORITIES, LOCAL ATTITUDES, AND VALUE JUDGEMENTS ( SOME COMMUNITIES STRIVE TO INCREASE DEVELOPMENT WHILE OTHERS WORK TO RESTRICT IT ).

**Sociological** CONSIDERS THE NEEDS AND FEELINGS OF THE PEOPLE WHO WORK/LIVE IN A GIVEN ENVIRONMENT.

**Political** INCLUDES LOCAL ORDINANCES, POLITICAL ATTITUDES AND LIKE MATERIAL COMPRISING THE POLITICAL COMPLEXION OF THE AREA.

**Future** INCORPORATES FUTURE GOALS AND RESPONSIBILITIES ( POPULATION TRENDS, ETC ), EXPECTED MISSION CHANGES, FUTURE INDUSTRIAL AND TECHNOLOGICAL IMPACT AND RELATED MATERIAL.

**Local** THE BASE AND THE SURROUNDING AREA IS A UNIQUE ENVIRONMENTAL ENTITY. A SPECIFIC EMPHASIS IS PLACED ON REFLECTING AN AREAS INDIVIDUALITY IN THE COMPREHENSIVE PLAN.

concepts will naturally fall into place. As a result, a variety of open spaces also provides a view of a variety of activities.

Areas of common open space can enhance good relationships among family housing neighbors. The difficulties arise when determining the appropriate amount needed. Children are the chief daytime users of common open space, and they are the most likely to use the space while in large groups, as Ms Cooper notes. She also suggests a guideline of allowing one acre of common open space for every 25 children expected to live in the area.

As a final point, Air Force designers must assure that common open space is clearly defined and limited. The base housing residents need to be aware of what constitutes acceptable usage of this space, and that common space does not replace private space or extend to the walls of the dwelling unit.

**Facility Relationships**

Many forward thinking designers, planners and architects are turning their attention toward developing "New Town" concepts. An important aspect of these concepts is the location of professional, commercial and recreational services within a local geographical area, convenient to the neighborhood dwellers. The air base automatically has the elements the New Town strives for. Unfortunately, base design is usually a result of limited resources and real estate, not a design effort directed toward the user.

Although the air base generally provides needed services in a relatively condensed area, user convenience or satisfaction cannot be taken for granted. Air Force responsibility as the base planner/designer is to improve the functional convenience and accessibility of base activities. In keeping with DOD policy, attention should be focused on the feasibility of a walk or short ride to and between facilities by conveniently locating services within the housing area. The pedestrian circulation system deserves a higher priority. Safe walkways should be provided, not just within residential areas, but also from residential areas to recreational activities, shopping centers and work locations (when feasible). Walkways should provide adequate lighting, wheelchair ramps, furniture amenities (benches, waste receptacles, etc.) and a variety of widths allowing people to stop and talk without blocking the route.

**Recreational Needs**

The Air Force has long provided on-base recreation for dependent children. Ms Cooper tells us that young children need both soft and hard surfaces to play on, preferably within sight of the mother or guardian, and accessible to the kitchen entrance of the home. Play equipment should be selected on the basis of children's preferences, as well as durability and safety. The play areas, or "tot lots," are most valuable when they provide opportunities for fantasy, adventure, physical development and contact with other children and nature. The potential creative uses of dirt mounding, concrete culverts, railroad ties, telephone poles, discarded tires and on-site concrete castings to provide these opportunities are limited only by the designer's imagination.

Developing a people-sensitive comprehensive plan for an Air Force base can be a worthwhile challenge. The designer, however, must not (intentionally or otherwise) ignore the individual user of any particular project. The architect/engineer can easily take the path of least resistance; applying a convenient standard example to whatever situation confronts him. The inevitable results are an environment for the "monolithic middle-class society," not really suited to any particular real world situation. A pre-design analysis, programming and (most important) testing the user desires prior to design would probably uncover a unique variety of user needs previously unknown to the designer.

The planner should strive to create both functional and attractive/maintainable space while conserving resources. A project should not achieve its objectives by chance and change orders, but by successfully working toward goals specifically defined early in the design process. If the pedestrian and vehicular circulation systems used to link space and housing facilities were the logical result of user activities/needs and not the product of a bureaucratic ("That's how it's supposed to be done, the regulations say so, we've never done it any other way, and I'm the OPR/expert anyway") system, the best possible people planning solution will normally follow.

In summary, the future direction of the Air Force will depend on how well we understand the relationship between our people and their physical environment. The first step toward an Air Force comprehensive plan is to understand man himself.

E&S

LIEUTENANT SHIERK *is a Consultant in the Engineering and Construction Division, Headquarters Strategic Air Command, Offutt AFB, Nebraska. He earned his bachelor's degree from Michigan State University and his master's degree from the University of Illinois. An associate member of the American Institute of Planners and the American Society of Landscape Architects, he is a Registered Landscape Architect in Iowa.*

Ceremonial customs that comprise the elements of military funerals are rooted in ancient military usage. What follows is an explanation of little known facts about ceremonial procedures and the overall Air Force

# Mortuary Affairs Program

by William G. Courtney

Authorities within the Mortuary Affairs Office at Headquarters US Air Force frequently receive inquiries regarding various aspects of the Air Force Mortuary Program, including the source of customs attendant to the conduct of funeral ceremonies, particularly those identified with military interment ceremonies. What follows is an explanation of the inquiries which seem most prevalent.

Ceremonial customs that comprise the elements of all military funerals are rooted in ancient military usage. In many cases, these traditions are based on expedients used long ago on the battlefield in time of war. The use of a caisson as a hearse, for example, is an obvious combat improvisation.

In a similar manner, the custom of covering the casket with a flag probably originated on the battlefield where caskets were not available and the flag, wrapped around the dead serviceman, served as a make-shift pall prior to burial. Later, these customs assumed a deeper significance than that of mere expediency. The fact that an American flag is used to cover the casket, for example, now symbolizes the fact that the soldier served in the Armed Forces of the United States and that this country assumes the responsibility of assisting in the burial of the soldier as a solemn and sacred obligation.

The assignment of escorts to accompany remains home was suggested in the early 1900s by Army Major George W. Cocheu. He also recommended that firing squads be provided for all military funerals, and that the flag be left on the casket for eventual presentation to the next of kin. These recommendations were approved and put into orders by the Army Chief of Staff, General Peyton C. March.

Other traditions observed in a military funeral had their origin on the battlefield. Some historians believe, for example, that the volley fired over the grave was first observed in earlier days of warfare when it was the custom of opposing armies to declare a truce so that each could clear its dead from the battlefield and bury them. According to this theory, the volley fired three times was originally a signal that the burial ceremony was finished and an invitation to the enemy to join in combat once again. Still, some historians feel the firing of three volleys over the grave originated with the Roman custom of casting earth three times upon the casket. The Romans then called the dead three times by name, which ended the funeral ceremony, after which friends and relatives of the deceased pronounced the word "Vale" (farewell) three times as they departed the tomb. So today, when the squad of soldiers fire three volleys over the grave, they are, in accordance with this old Roman custom, bidding their comrade "farewell," three times.

The flying of the flag at half-staff during a funeral also has a peculiarly military significance. In early times, it was the custom to fly the victor's colors over the flag of the defeated enemy and to run down the enemy's colors for that purpose. The lowering of the flag to half-staff during a military funeral symbolizes the victory of life over death and the ascendency of the spiritual over the temporal.

The sounding of "Taps" over the grave has an obvious origin in military custom. Since Taps is the last bugle call the soldier hears at night, it is particularly appropriate that it be played over his grave to mark the beginning of his last, long sleep and to express hope and confidence in an ultimate reveille to come.

Today, the Air Force attempts to perpetuate these customs through the provision of burial honors at the funeral of its deceased active duty, retired and former members. Requests should be made to the Mortuary Officer at the nearest Air Force base or other military installation to request burial honors. Members of base burial honor teams participate on a voluntary basis. Training requirements are, understandably, rigid in order that the team may function properly in the conduct of this solemn ceremony. Because of the sometimes heavy volume of requests, distances involved, or the previous commitment of trained teams, it is not always possible to fulfill each and every request.

Other inquiries are received relating to basic mortuary benefits available to assist the next of kin in arranging for preservation,

casketing and final disposition of the remains of a deceased active duty member.

**10 U.S.C. 1482** authorizes the military department concerned to defray expenses incident to recovery and identification (if required) of the remains; preservation and cremation (if requested by the next of kin); furnishing necessary uniform items; furnishing a casket or urn or both; transportation to the place designated by the next of kin; provision of an escort of one person to accompany the remains; an interment allowance to assist the next of kin with expenses relating to the funeral service conducted at the final destination; and provision of a flag of the United States for use in the funeral and subsequent presentation to the next of kin.

It should be noted that this legislative act applies solely to deceased active duty members and its provisions, cannot, unfortunately, be extended to retired or former members (veterans) of the Armed Forces. Retired and former members are eligible for certain benefits administered by the Veterans Administration and Social Security Administration. All funeral directors are aware of benefits emanating from Veterans Administration and Social Security sources and will provide necessary forms for applying for those benefits. The only exception to this concerns a member who is retired while a patient in a government hospital and is retained continuously as an "in-patient" until death occurs. The retired/retained individual is entitled to full benefits commensurate with active duty members.

If death of the active duty member occurs within the United States, the military activity at or nearest the place of death, upon notification that the death has occurred, will make all necessary arrangements. All agencies within the Department of Defense cooperate fully to assure that all actions are properly carried out as expeditiously as possible. The military installation involved will contract with a local civilian funeral establishment to perform the necessary services and provide a military specification-type casket. This casket is used for all deceased active duty members regardless of rank.

Disposition instructions are obtained from the next of kin regarding their desires as to where the remains should be shipped. The remains, with an escort of one individual, are shipped to a funeral director designated by the next of kin. Every effort is made to complete that shipment as expeditiously as possible. Upon arrival at the funeral establishment at the final destination, the funeral director deals directly with the next of kin, or designated representative, in making arrangements. Expenses relating to the funeral service is a matter between the next of kin and the funeral establishment. An interment allowance is available to assist in defraying those expenses.

If death of the active duty member occurs while assigned in an overseas area, the remains are processed through Armed Forces overseas mortuaries. These facilities are staffed with licensed, qualified civilian morticians employed from within the United States under Federal Civil Service for specified periods of service at the overseas mortuary. The remains are moved via military airlift to designated Aerial Port Mortuaries in the United States.

**WILLIAM COURTNEY** *is the Chief, Mortuary Branch, Services Division, Directorate of Engineering and Services, Headquarters US Air Force. He is responsible for directing and controlling the Air Force Mortuary Affairs Program world-wide. A graduate of the Kentucky School of Mortuary Science, he is a Licensed Funeral Director and Embalmer in Virginia.*

Commercial air from the overseas area is authorized if government air is not available.

Upon arrival at the Aerial Port Mortuary at Dover AFB, Delaware, or Travis AFB, California, the remains are transferred to the port mortuary facility where the remains are inspected to determine whether preservation is satisfactory.

Within the United States, commercial air carriers are used for all transportation requirements. The use of government air within the United States is expressly prohibited.

An escort is selected, normally of equal or higher grade, to accompany the remains to the final destination. He is thoroughly briefed on his duties, his appearance and conduct, and the responsibility he bears as the official Air Force representative in that specific case. He is instructed to attend the funeral service unless specifically requested not to by the next of kin or family of the deceased. Upon his return to the shipping installation (CONUS base or Aerial Port Mortuary), he is required to submit a detailed report concerning the satisfaction or dissatisfaction of the family, their comments, and any unusual events which occurred during the period of his escort duty.

Reference was made earlier to the interment allowance for which the next of kin may apply to assist in defrayment of expenses incurred in the funeral service. This allowance is subject to periodic review in order to determine whether it is reasonable and adequate in comparison with contemporary basic costs of the civilian funeral industry. Currently, when the remains are interred in a private cemetery, a maximum allowance of $700 is authorized. If the remains are consigned to a civilian funeral establishment prior to burial in a government cemetery, the maximum allowance is $450. If the remains are consigned directly to a government cemetery, the max-

*(continued on page 28)*

# PROMOTIONS

A total of 123 engineering and services officers have been named for promotions ranging from major to major general in the past few months.

Brig Gen William D. Gilbert, Deputy Director, Engineering and Services, Headquarters US Air Force, was nominated for promotion to major general.

Col Allison G. Glover, Deputy Chief of Staff, Engineering and Services, Headquarters Air Force Systems Command, and Col Charles W. Lamb, Deputy Chief of Staff, Engineering and Services, Headquarters Air Force Logistics Command, were nominated for promotion to the rank of brigadier general.

Fifty engineering and services officers were named for promotion to lieutenant colonel by the Temporary CY 76 Lieutenant Colonel Promotion Board. They include:

**PRIMARY ZONE**
*Begansky, Paul R.
Bell, Robert L.
Boyer, Robert E.
Brown, Roger A.
Butler, William C., Jr
Compton, Phil V.
Cranston, James R.
Duffie, Boyd T., III
England, Lawrence E.
Fukumoto, Malcolm T.
Gates, James L.
Gienty, Donald F.
Giger, John M.
Handy, Burrell R., III
Haug, Gunter
Hicks, Joe L.
Horsma, Richard J.
Idehara, George M.
Immel, Allen E.
Jackson, Tyler M.
Jacob, Corwin E.
Knipfer, Ronald E.
Kreis, Charles W.
Liepins, Andris I.
Lynch, Robert H.
Mackie, William A., Jr
Main, Don R.
Missell, Richard W.
Moore, Edward S., II
Moore, John L.
Morton, John E., Jr
Porco, John V., Jr
Rigers, Charles E.
Rindahl, Milton D.
Rochez, Fred
Ruffner, Gerald A.
Ruschmeier, Peter F.
Scambilis, Nicholas A.
Seamon, John B.
Shirley, Henry G.
Sowers, John C.
Sudbrink, William H.
Waters, Ronald H.
Weeden, Ronald J.
West, James D.
Willie, Lavern A.
Wyatt, Richard H.
Zeigler, Curtis C.
**SECONDARY ZONE**
Bull, David E.
Storm, John H.

Characteristics observed in the whole person records of the promotees revealed that about 80 percent of the selectees had Intermediate Service School or higher in Professional Military Education and about the same number had an advanced degree. The list represents officers in numerous levels of organization that mirrors opportunities in the career fields: base level (60%), MAJCOM staff, AF/IG, Air Staff and Joint/Departmental commands.

Seventy engineering and services officers were selected for promotion to major. They include:

**PRIMARY ZONE**
Adams, Gerald R.
Adams, Harold Q., Jr
Allen, John J.
Almond, Russell H., Jr
Barrett, Donald R.
Birch, Craig A.
*Blevins, Gordon C.
*Chigbrow, Gary W.
Choate, John S.
Christensen, Jens E.
Cirillo, Francis A., Jr
Clendenin, Gary L.
Cocheo, Dennis
Congleton, Duane E.
Curtis, Johnson O.
Dant, Robert E.
Davis, Edward R.
Deaver, William H., III
Ebdon, Thomas J., III
Fisher, Wayne T.
Frederick, James E.
Gibson, James W.
Girard, Roger J.
Gray, Walter L.
Highfill, Larry G.
Hlad, Dennis F.
Hokanson, Lawence D.
Ingalls, Lawrence H.
Jacoby, George A.
Lee, Gerald A.
Lewis, James F., Jr
Loncki, Joseph
*Markle, Lawrence J.
Matestic, Ronald E.
McBride, Gerald D.
*Melrose, William L.
Menzies, Stephen P.
*Miller, Gordon O.
Morris, Robert D.
Mosbruger, Charles D.
Muller, Hugh W.
*Neff, Arthur D.
Newton, James A., Jr
*Parks, Watson C.
Paterson, Daniel E.
Phillippi, Stephen W.
Posjena, Guenter S.
*Pratchett, Terry A.
*Rivera, Joseph F., Jr
Roberts, James N.
Rodgers, Willie E.
Scott, James K.
Sherman, Howard C.
Shoop, Donald E.
Simpson, William E.
Smith, Daniel M.
Snider, Jerry C.
Sugg, Joseph P.
Thomas, Donald J., Sr
Thompson, James D.
Toran, Isaiah
*Travis, Byron T.
*Walls, Charles O.
Ware, Russell L.
Webbenhurst, Robert C.
Zody, James G.
**SECONDARY ZONE**
Chace, Harvey D.
Heidler, Clare D., III
*Scott, James H.
Stowell, Philip G.

## PALACE BLUEPRINT Updates Listing of Jobs Available to Civil Engineers

An updated listing of jobs available to Air Force Civil Engineers has been compiled by PALACE BLUEPRINT. It gives officers more visibility of civil engineering career opportunities and enables them to develop more comprehensive and informed career plans. It should enable officers to actually participate in their own career development and convey their desires via AF Form 90 to the Air Force Military Personnel Center.

Commands can check with Lt Col Giandolfi, AUTOVON 227-4937, AF/PREMC, if additional copies are required to assure maximum distribution.

*Services officers.

# NEW TECHNOLOGIES TO MEET ENERGY NEEDS

The Air Force Civil Engineering Center is the focal point for facilities energy research and development. Results of the Center's investigations on several projects will provide base engineers with useful engineering aids. This is another example of what is being done to apply

by Lt Col Sterling E. Schultz, PE

The nation, the Department of Defense (DOD) and the Air Force face continuing serious energy problems involving limited choices, continued dependence on diminishing petroleum supplies and an extended period of increasingly costly energy resources. Furthermore, the 1973-1974 oil embargo only highlighted how vulnerable we could be through energy supply disruptions. Yet, the total fossil energy demand forecast to 2050 indicates increasing dependence on imported fuels at increasing costs. Since no political action or technological development that would relieve the United States of its dependence on imported oil is anticipated, the US must develop new domestic energy sources in an effort to reduce the dependence on petroleum fuels.

Current data on energy usage indicate that the DOD consumes 1.9 percent of the nation's total energy demand; 72 percent of DOD's demand is for petroleum. The Air Force's portion of the total DOD energy demand is 49 percent; 76 percent of the Air Force demand consists of petroleum products. Aircraft operations consume 90.7 percent of the Air Force total petroleum requirements, **Figure 1.** Since the types of aircraft now in operation will continue to be the mainstay of the Air Force until the turn of the century, unless these aircraft are modified extensively, liquid hydrocarbons will continue to be the primary fuel well into the 21st Century.

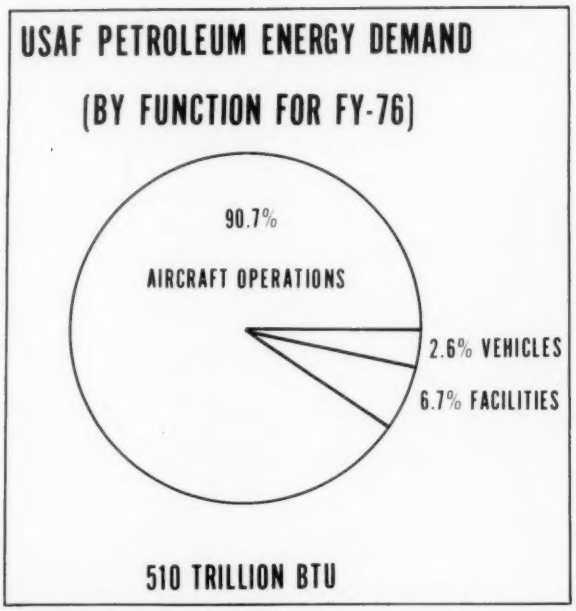



**Figure 1**

Given the great dependence on petroleum fuels, the Air Force has taken a positive role by formulating a set of energy goals and pursuing an aggressive research and development (R&D) program while establishing energy policies and guidelines that will minimize the impact of any future oil embargoes or energy shortfalls.

**Energy Goals, Strategies and Objectives***

Air Force energy goals are to assure efficient use of energy resources to minimize the adverse impact of increasing fuel prices on Air Force operations. Attainment of these goals is related to increasing the efficiency and reliability of energy-using systems without compromising flexibility, readiness or performance and to ensuring that the Air Force can make a smooth transition from rapidly depleting traditional energy sources to synthetic fuel and renewable energy forms.

To achieve these goals, given the stated considerations, the Air Force has chosen three approaches or strategies: energy conservation; synthetic fuels; and alternate energy sources. The strategies are both near-and-long-term in application and, they apply to the three functional categories of Air Force energy demand, **Figure 2**, as well as the Energy R&D Program. Through energy conservation efforts, the Air Force is eliminating wasteful use of fuel and developing more efficient aircraft propulsion and facilities energy systems. The Air Force's approach to synthetic fuels is to encourage and incentivize national programs for commercialization and to initiate both laboratory and operational test projects that will ensure compatibility between these fuels and Air Force equipment. The Air Force is maintaining cognizance of the state-of-the-art for developing local renewable energy sources (e.g., solar, wind, geothermal) and exploiting their use where feasible.

Using these three approaches to solving the energy problems, the Air Force has established the following objectives:

**Energy Conservation**

- Establish and meet or surpass energy conservation goals.
- Implement, monitor and evaluate energy management programs at all installations to promote efficient energy use.
- Promote energy conservation through continued technology transfer to energy users, pro-

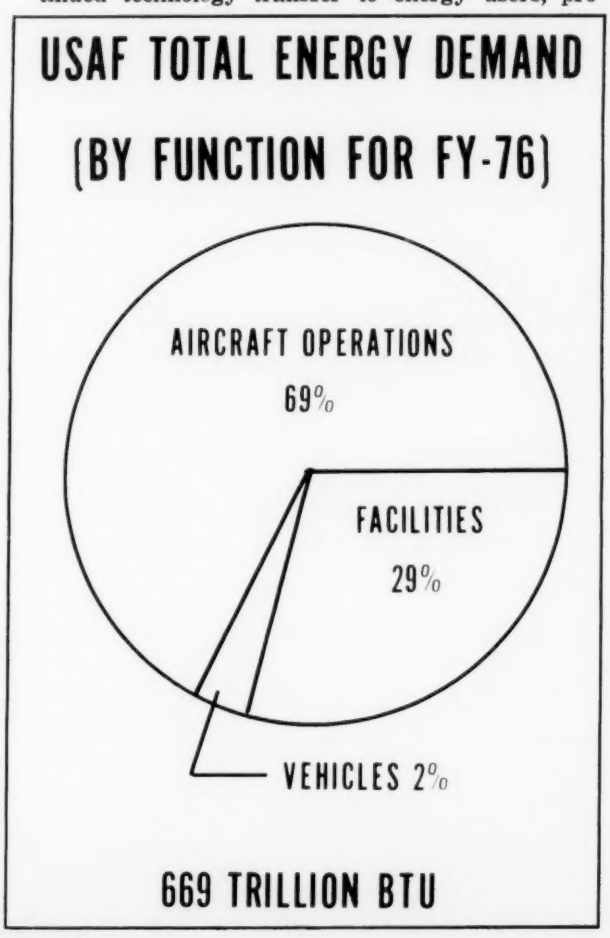



**Figure 2**

*Air Force energy goals, strategies and objectives are defined as follows: A technological goal is the broadest possible statement defining aims that can be effected with respect to the prescribed mission of the Air Force; a strategy is one of several approaches that has been selected as a means of meeting the goals; and an objective is a specific end point or position to be attained.

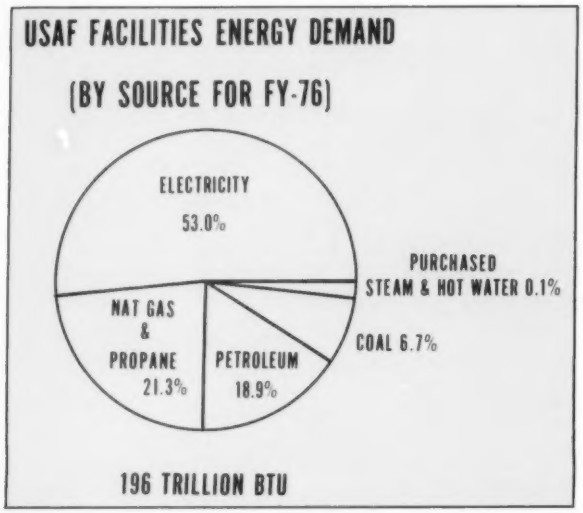



**Figure 3**

gram managers, technicians and engineers through the continued development of operating procedures and technical expertise.

- Develop, test and evaluate more efficient facilities designs, construction materials and techniques and control systems.
- Develop, test and evaluate improved propulsion aircraft turbines with reduced specific fuel consumption.
- Reduce aerodynamics drag and aircraft weight as a means of conserving energy.
- Improve aircraft operational procedures.

**Synthetic Fuels**

- Develop, test and evaluate methods to increase the availability of aircraft fuels from conventional supplies of petroleum and non-petroleum sources.
- Test, evaluate and qualify synthetic and multi-fuel capability for aircraft use.

**Alternate Energy Sources**

- Test and evaluate energy systems that would be more self-sufficient, reduce the use of petroleum or both.
- Select the most cost-effective sites and apply/demonstrate technology for utilization of renewable energy sources such as solar, wind, geothermal or other indigenous sources.
- Promote energy self-sufficiency through continued development of technical expertise in energy systems through technology transfer mechanisms.

In developing the Air Force energy policies and guidelines, the first consideration was the immediate impact of a petroleum shortage caused by the 1973-1974 oil embargo; therefore, short-term fuel reduction measures were implemented. However, potential long-range solutions were also identified and analytical studies of these solutions were initiated. These analyses led to formulation of the Air Force Energy R&D Program, which is integral to the overall planning and policy regarding the Air Force's energy needs. It conforms to the general DOD energy R&D goals and policy established by the Defense Energy Task Group (DETG) in November 1973 and as further refined by the Director of Defense Research and Engineering (DDR&E).

The Deputy Secretary of Defense, with amplification by DDR&E, assigned the total responsibility for aircraft-related energy R&D to the Air Force, ground-related to the Army, sea-related to the Navy, and ground installation-related to all. According to the same guidance, all Services have the responsibility of achieving energy independence for remote installations. A more detailed overview of Air Force energy R&D efforts and the performing laboratories/centers is presented in the **Air Force Energy R&D Program Synopsis, FY 76-81, HQ USAF/RDPS, 3 December 1975.**

**Facilities Energy Research & Development**

Reflecting on the Air Force's concern for the state of the nation's energy resources, the Directorate of Facilities and Systems was established within the Air Force Civil Engineering Center (AFCEC) as the focal point for facilities energy R&D. The work of this specialized engineering group is aimed at applying emerging technologies to specific Air Force needs. A few typical energy projects among the many under investigation at the Center are highlighted here because their completion this fiscal year will place in the hands of base engineers useful engineering aids and put into the field operational prototypes of future facilities energy systems. These products of research funded under R&D programs and the Engineering and Services Investigational Engineering program will be featured in following issues of this publication.

**Solar Assisted/Augmented Heat Pump Systems**

The objective of this effort is to identify optimum system combinations to provide space heating, hot water heating and space cooling with electric heat pumps, with and without solar boosted systems. Many Air Force sites are suited, by location and climate, for heating and cooling systems using this form of energy generation. Various concepts are being studied, a design handbook compiled, and systems with the widest applicability to Air Force sites will be developed and demonstrated.

TABLE 1
FY 73-FY 76 FACILITIES ENERGY CONSUMPTION

| YEAR | CONSUMPTION ($10^{12}$ BTU'S) | SAVINGS Vs FY 73 | SAVINGS Vs PREVIOUS YEAR |
|---|---|---|---|
| FY 73 | 241.6 | ---- | ---- |
| FY 74 | 209.0 | 13.5% | 13.5% |
| FY 75 | 204.2 | 15.5% | 2.3% |
| FY 76 | 196.6 | 18.6% | 3.7% |
| FY 77(ESTIMATE) | (196.6) | (18.6) | (0.0%) |

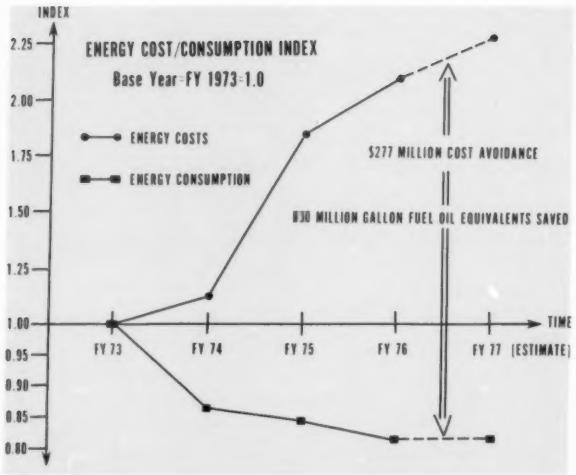



**Figure 4**

### Building Loads and System Thermodynamics (BLAST)

This product, soon to be available, is a computer program for determining thermal loads and predicting energy use by simulation of HVAC systems. This model is believed to be the best compromise between input requirements and accuracy of results.

### Wind Energy Conversion System (WECS)

A 15 kilowatt wind turbine was installed at Francis E. Warren AFB during November 1976. Under investigation are power grid and energy storage/retrieval systems, as well as the solution of application and user interface problems. The Center is developing the technological base for future application of wind generated power systems at remote Air Force installations.

### Energy Conservation Handbook

Soon to be released is a comprehensive handbook for base engineers that consolidates energy conservation measures applicable to Air Force real property facilities. It will provide engineers with an integrated approach to evaluating options, accomplishing analyses and using computer aids. An Executive Summary volume for energy program managers will also be released at the same time.

TABLE 2

FY 73-FY 76 FACILITIES ENERGY COSTS

| YEAR | EXPENDITURES ($ MILLIONS) | INCREASE Vs FY 73 | INCREASE Vs PREVIOUS YEAR |
|---|---|---|---|
| FY 73 | 163 | --- | --- |
| FY 74 | 185 | 13% | 13% |
| FY 75 | 311 | 91% | 68% |
| FY 76 | 355 | 118% | 14% |
| FY 77 (ESTIMATE) | (386) | (137%) | ( 9%) |

### Current Status of Energy Conservation Efforts

The only significant near-term solution to the decreasing availability of energy sources and increasing costs is conservation, e.g., more efficient use of energy. During FY 1976, the Air Force was responsible for 55.5 percent of DOD's total petroleum consumption. Because aircraft use such a large portion of the Air Force's energy demand, major energy saving actions and research efforts are aimed at this area. During FY 1976, reduction in flying hours and operational improvements saved 8.2 percent jet fuel over the FY 1975 consumption level.

Air Force facilities energy demand for FY 1976 is shown in **Figure 3.** Reduction in facilities (utilities) energy consumption over the past three years is principally a direct result of low cost energy management actions to regulate the use of our energy resources. During FY 1973, about 242 million Mega British Thermal Units (MBTUs) of energy were consumed to provide electricity, heating and cooling to support Air Force installation requirements, **Table 1.** The cost of these energy resources of coal, petroleum, natural gas, propane and purchased electricity was approximately $163 million, **Table 2.** By the end of FY 1976, our total energy consumption was almost 19 percent below that of the FY 1973 level. Yet, this reduced amount of consumed energy cost the Air Force about $355 million, an increase of 118 percent during the relatively short span of about 36 months.

When the Engineering and Services budget estimate for FY 1977 is compared to FY 1976 actual expenditures, a nine percent increase in the cost of facilities energy is anticipated. In other words, from FY 1973 to FY 1977 Air Force utilities energy budget will more than double, while during the same time period, conservation measures will have reduced the consumption level by a factor of about one-fifth. **Figure 4** dramatically illustrates these trends and shows both the monetary and energy savings derived from the FY 1974-FY 1976 conservation programs. However, more savings can be realized. Studies have shown that as much as 40 percent of the energy consumed in buildings is wasted due to inadequate construction, inadequate operating practices, inefficient equipment and unnecessary lighting and heating/cooling levels.

To couple energy management with future reductions in consumption, the Air Staff has dedicated $149 million in the FY 1976-FY 1978 MCPs to increase the energy effectiveness of our existing facilities, **Table 3.** The Energy Conservation Investment Program (ECIP) is a comprehensive package of modifications and improvements to base facilities and military family housing units that is estimated to pay for itself via energy savings in less than five years and provide a $36 million per year cost avoidance in utilities energy billings. As currently recommended by the DOD, the FY 1979-

TABLE 3

ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP), FY 76 - FY 78 MCP

| YEAR | NO. PROJECTS | PA ($ MILLION) | SAVINGS ($ MILLION) | PAYBACK (YRS) | STATUS |
|---|---|---|---|---|---|
| FY 76 | 250 | 62 | 15 | 4.1 | CONSTRUCTION |
| FY 77 | 66 | 36 | 9 | 4.0 | DESIGN |
| FY 78 | 67 | 51 | 12 | 4.3 | DESIGN |
| FY 79-82 (EST.) | (UNKNOWN) | (56) | ( 9) | 6.0 | PROGRAMMING |
| TOTALS: | 383 | 205 | 45 | 4.6 | |

NOTE: DATA INCLUDE MFH, NGB AND AFRES PROGRAMS

FY 1982 ECIPs will be limited to about $14 million per year, and they will be based on a six year maximum payback period per individual project.

**Meeting the Energy Management Challenge**

Maximizing energy conservation while maintaining force readiness during this extended period of increasingly costly energy resources is one of the most significant peacetime management challenges the Air Force has ever faced. The budgetary impact of this increased cost has already caused the Air Force to operate nearer to the readiness margin than would have otherwise been planned.

The targets of this mandatory energy management focus must continue to include: aircraft design and operation, flying training, facilities design, construction and operation, and equipment procurement, maintenance and operation. To this end, as part of the total Air Force Energy Program, the AFCEC will continue to apply new technologies to meet Air Force facilities energy needs. C&S

COLONEL SCHULTZ *is Director of Facilities Systems, Air Force Civil Engineering Center, Tyndall AFB, Florida. He received his bachelor's and master's degrees in civil engineering from the University of Arizona and his doctorate degree in environmental engineering at the University of Florida. Registered as a Professional Engineer in Colorado and North Carolina, he is also Chairman, Facilities Energy Sub-committee of Joint Services, Civil Engineering R&D Coordinating Group.*

## *Mortuary Affairs Program (cont'd)*

imum allowance is $75. The escort provides the necessary forms (DD 1375) for the next of kin to file a claim.

The government, upon request of the next of kin, will furnish a headstone to mark the grave of the deceased. This benefit is also available to retired members and honorably discharged veterans. For an active duty member, the escort provides the necessary application forms. The Veterans Administration exercises jurisdiction over the procurement of headstones. For a retired or former member, any funeral director or local Veterans Administration office can provide necessary forms. Direct communication can also be made by survivors of retired or veteran members by writing the Director, National Cemetery System (42A), Veterans Administration Central Office, 810 Vermont Avenue, N.W., Washington DC 20420.

In certain situations where the remains of the deceased active duty member are not recovered, the next of kin is entitled to a maximum allowance of $450 for memorial service expenses. A memorial flag is also authorized for presentation to the next of kin. A memorial headstone may also be provided for erection in a private or government cemetery in memory of the individual.

Inquiries regarding Mortuary Affairs matters not covered in this article can be requested from the Mortuary Officer at the nearest Air Force base. It is far better to be informed on matters of this nature prior to your actual time of need. C&S

## *Make the Form 90 (cont'd)*

**Future Changes**

A new AF Form 90 is being developed and is scheduled to be published during the spring of 1977. It will be similar to the present one, a little simpler and with an expanded remarks section.

**Summary**

When did you last fill out a Form 90? Is it current? Are you a volunteer for overseas, but do not want to go overseas? Or are you a non-volunteer who would greatly enjoy an oversea tour? Have you identified your educational, academic and professional military requirements? Have you determined at least the next three assignments? Are these next three assignments possible and realistic for an officer with your rank, experience, education, whole person record, etc? What is your present assignment status? If any of the above questions is of concern to you, contact PALACE BLUEPRINT at AUTOVON 487-3451. We consider your career very important.

**"The essence of career planning lies not so much in the selection of your next assignment as it does in the manner in which you are carrying out your present one. So far as you are concerned, the best career development job is the one you have right now!"** C&S

Air Force Form 90 assists the officer in participating in his next assignment, communicating his educational desires and establishing a career plan. Here are some suggestions on how you can

# Make the Form 90 a Dream Sheet & Make it a Practical Tool

by Lt Col Marvin T. Howell, PE, and Capt Nathan Pack

The Officer Career Objective Statement, AF Form 90, allows the Engineering and Services officer the opportunity to participate in the assignment selection process, communicate his educational desires, and formally establish a personal career plan. Hastily completed, it is merely a dream sheet; properly completed, it becomes a practical tool. The importance of the Form 90 will be outlined and how to make it work for the officer in pursuing his Air Force career will be explained.

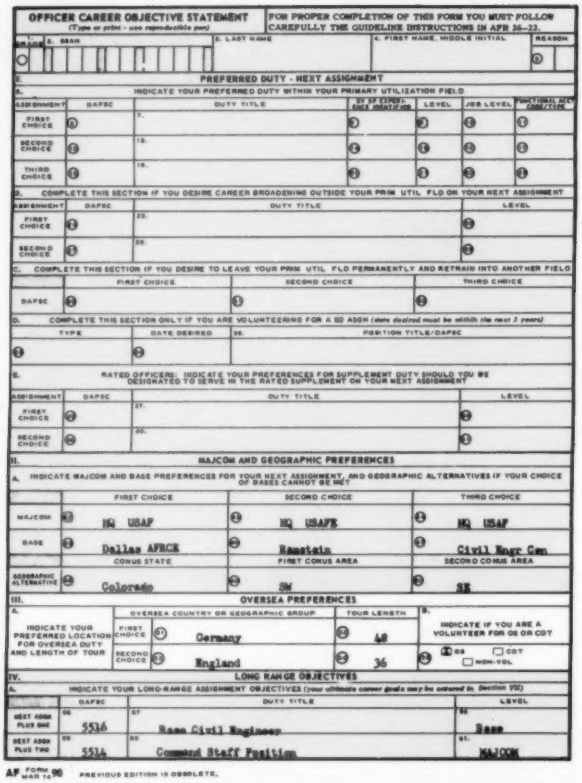
**Preparing Your Form 90**

In the initial preparation stages, too often most officers first ask themselves where they want to go. Instead, officers should go through several other steps prior to establishing their geographical preferences. What is most important in arriving at a realistic Form 90? First, the officer should determine his status. How long will I probably remain in my present job? Am I overseas eligible? Can I move CONUS to CONUS? Can I be considered for an Air Force Institute of Technology graduate program? PALACE BLUEPRINT receives numerous inquiries daily from officers inquiring about their assignment vulnerability status; it stands ready to assist anyone in determining his present assignment status.

Next, the officer should look at what he has previously done and decide on what he thinks he should do. Often, several alternate courses of action are available. The Civil Engineering and Services Job Lists can assist the officer since each job (title, location, rank and AFSC requirement) is listed for his information. Read carefully the career progression guides included in **AFR 36-23.** A major revision to Chapter 28, Services Career Progression Guide, will be available during the summer of 1977. If an officer needs further guidance, several avenues normally are open to him. A conference with his commander, supervisor, local career development officer or CBPO, or a call or letter to PALACE BLUEPRINT, are several ways to obtain guidance.

PALACE BLUEPRINT starts working assignments about six months ahead of an officer's availability date. If he is overseas eligible or desires an oversea assignment, he should contact PALACE BLUEPRINT to see what is coming open. If a job in a particular country is particularly appealing, then he may want to volunteer for that area. Three points are important here:

- In volunteering for a country, an officer cannot volunteer for a job, only a country; but if he is not a volunteer for a country, he will not be considered for the job if other qualified volunteers exist. So, if an officer is interested in being considered for a particular job, he should **volunteer.** He should place the job title in the "next assignment" block (Item 57) and further outline his desires in the "remarks" section (Item VII).
- An officer should not volunteer for overseas



OFFICER CAREER OBJECTIVE STATEMENT

(Type or print - use reproducible pen)

FOR PROPER COMPLETION OF THIS FORM YOU MUST FOLLOW CAREFULLY THE GUIDELINE INSTRUCTIONS IN AFR 36-23.

1. SOAN | 2. SSAN | 3. LAST NAME | 4. FIRST NAME, MIDDLE INITIAL | REASON

I. PREFERRED DUTY - NEXT ASSIGNMENT

A. INDICATE YOUR PREFERRED DUTY WITHIN YOUR PRIMARY UTILIZATION FIELD

| ASSIGNMENT | DAFSC | DUTY TITLE | BY AF EXPERIENCE GRADE/RANK | LEVEL | JOB LEVEL | PROFESSIONAL ACHIEVEMENT |
|---|---|---|---|---|---|---|
| FIRST CHOICE | 6 | 7. | 8 | 9 | 10 | 11 |
| SECOND CHOICE | 12 | 13. | 14 | 15 | 16 | 17 |
| THIRD CHOICE | 18 | 19. | 20 | 21 | 22 | 23 |

B. COMPLETE THIS SECTION IF YOU DESIRE CAREER BROADENING OUTSIDE YOUR PRIM UTIL FLD OR YOUR NEXT ASSIGNMENT

| ASSIGNMENT | DAFSC | DUTY TITLE | LEVEL |
|---|---|---|---|
| FIRST CHOICE | 24 | 25. | 26 |
| SECOND CHOICE | 27 | 28. | 29 |

C. COMPLETE THIS SECTION IF YOU DESIRE TO LEAVE YOUR PRIM UTIL FLD PERMANENTLY AND RETRAIN INTO ANOTHER FIELD

| FIRST CHOICE | SECOND CHOICE | THIRD CHOICE |
|---|---|---|
| DAFSC 30 | 31 | 32 |

D. COMPLETE THIS SECTION ONLY IF YOU ARE VOLUNTEERING FOR A 60 ASGN (date desired must be within the next 3 years)

| TYPE | DATE DESIRED | 35. POSITION TITLE/DAFSC |
|---|---|---|
| 33 | 34 | |

E. RATED OFFICERS: INDICATE YOUR PREFERENCES FOR SUPPLEMENT DUTY SHOULD YOU BE DESIGNATED TO SERVE IN THE RATED SUPPLEMENT ON YOUR NEXT ASSIGNMENT

| ASSIGNMENT | DAFSC | DUTY TITLE | LEVEL |
|---|---|---|---|
| FIRST CHOICE | 36 | 37. | 38 |
| SECOND CHOICE | 39 | 40. | 41 |

II. MAJCOM AND GEOGRAPHIC PREFERENCES

A. INDICATE MAJCOM AND BASE PREFERENCES FOR YOUR NEXT ASSIGNMENT, AND GEOGRAPHIC ALTERNATIVES IF YOUR CHOICE OF BASES CANNOT BE MET

| | FIRST CHOICE | SECOND CHOICE | THIRD CHOICE |
|---|---|---|---|
| MAJCOM | 42 HQ USAF | 43 HQ USAFE | 44 HQ USAF |
| BASE | 45 Dallas AFRCE | 46 Ramstein | 47 Civil Engr Gen |
| | CONUS STATE | FIRST CONUS AREA | SECOND CONUS AREA |
| GEOGRAPHIC ALTERNATIVE | 48 Colorado | 49 SW | 50 SE |

III. OVERSEA PREFERENCES

A. INDICATE YOUR PREFERRED LOCATION FOR OVERSEA DUTY AND LENGTH OF TOUR

| | OVERSEA COUNTRY OR GEOGRAPHIC GROUP | TOUR LENGTH |
|---|---|---|
| FIRST CHOICE | 51 Germany | 52 48 |
| SECOND CHOICE | 53 England | 54 36 |

B. INDICATE IF YOU ARE A VOLUNTEER FOR OS OR COT: 55 ☒ OS ☐ COT ☐ NON-VOL

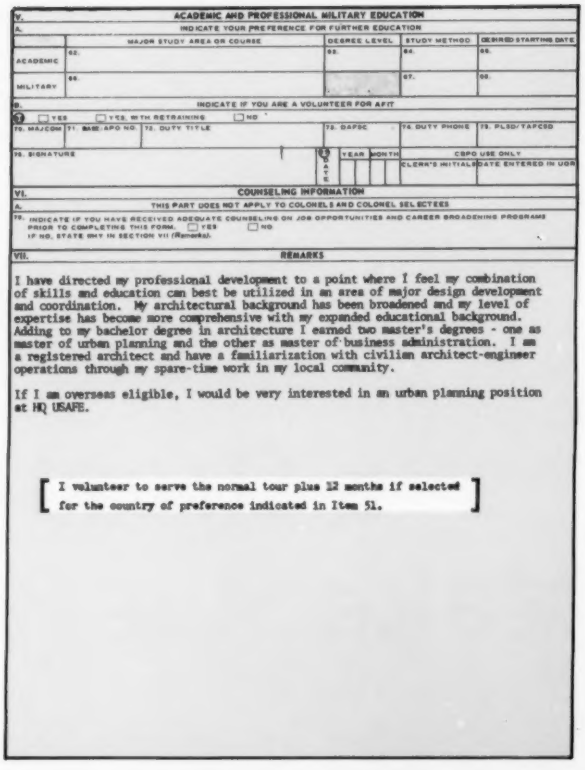
IV. LONG RANGE OBJECTIVES

A. INDICATE YOUR LONG-RANGE ASSIGNMENT OBJECTIVES (your ultimate career goals may be entered in Section VII)

| | DAFSC | DUTY TITLE | LEVEL |
|---|---|---|---|
| NEXT ASGN PLUS ONE | 56 5516 | 57 Base Civil Engineer | 58 Base |
| NEXT ASGN PLUS TWO | 59 5516 | 60 Command Staff Position | 61 MAJCOM |

AF FORM 90 MAR 76 PREVIOUS EDITION IS OBSOLETE.

**Figure 1: In this Form 90, the entry in Part III (A) 51 is an example of an extended overseas tour. In Part III (B) 52, the entry is an example of a normal volunteer overseas tour.**



V. ACADEMIC AND PROFESSIONAL MILITARY EDUCATION

A. INDICATE YOUR PREFERENCE FOR FURTHER EDUCATION

| | MAJOR STUDY AREA OR COURSE | DEGREE LEVEL | STUDY METHOD | DESIRED STARTING DATE |
|---|---|---|---|---|
| ACADEMIC | 62. | 63. | 64. | 65. |
| MILITARY | 66. | | 67. | 68. |

B. INDICATE IF YOU ARE A VOLUNTEER FOR AFIT

69 ☐ YES ☐ YES, WITH RETRAINING ☐ NO

| 70. MAJCOM | 71. BASE, APO NO. | 72. DUTY TITLE | 73. DAFSC | 74. DUTY PHONE | 75. PLSD/TAFCSD |
|---|---|---|---|---|---|
| | | | | | |

76. SIGNATURE | 77. DATE: YEAR MONTH DAY | CBPO USE ONLY: CLERK'S INITIALS | DATE ENTERED IN UDC

VI. COUNSELING INFORMATION

A. THIS PART DOES NOT APPLY TO COLONELS AND COLONEL SELECTEES

78. INDICATE IF YOU HAVE RECEIVED ADEQUATE COUNSELING ON JOB OPPORTUNITIES AND CAREER BROADENING PROGRAMS PRIOR TO COMPLETING THIS FORM. ☐ YES ☐ NO
IF NO, STATE WHY IN SECTION VII (Remarks).

VII. REMARKS

I have directed my professional development to a point where I feel my combination of skills and education can best be utilized in an area of major design development and coordination. My architectural background has been broadened and my level of expertise has become more comprehensive with my expanded educational background. Adding to my bachelor degree in architecture I earned two master's degrees - one as master of urban planning and the other as master of business administration. I am a registered architect and have a familiarization with civilian architect-engineer operations through my spare-time work in my local community.

If I am overseas eligible, I would be very interested in an urban planning position at HQ USAFE.

[ I volunteer to serve the normal tour plus 12 months if selected for the country of preference indicated in Item 51. ]

**Figure 2: The bracketed comment on the backside of the Form 90 is an example of a statement that must be made.**

unless he is ready to go **then.** Once selected for an assignment, he cannot withdraw his volunteer statement.

- A volunteer statement for a particular country, Germany for example, means the officer will not be selected as a volunteer for any oversea country other than Germany.

Who will get the particular job? The most qualified volunteer will, which means the officer who has been on station longest, has the experience and education to do the job, meets the rank requirements, and does not have an assignment restriction (on a controlled tour, education delay, Code 58—frozen for a particular project until its completion, etc.).

Recently, a new Extended Overseas Tour (EOT) policy was implemented, which allows the officer priority assignment consideration if he volunteers for a standard tour plus 12 months. **Figure 1** and **Figure 2** show how an officer can volunteer for overseas under both conditions, EOT and normal.

Career broadening assignments consist of two types: within and outside the officer's career field. Examples of a career broadening assignment within engineering would be teaching at the Civil Engineering School or Air Force Academy, Joint/Combined Staff, ASTRA assignment or possibly an IG assignment. Examples of career broadening assignments within Services include assignments with the Army and Air Force Exchange Service, Air Force Commissary Service, and Headquarters US Air Force and/or major command staffs. Outside of the career field, PALACE BLUEPRINT recommends missiles operations, ROTC instructor and weapons director, or some special assignment such as a Leadership Development center and Army/Navy Exchange Program.

When can an officer look for a career broadening assignment? At the earliest, the four year point, with seven to 14 years, as the most likely time. Only a few are selected for career broadening after the 14 year point.

Is it necessary to go on a career broadening assignment? No, the engineering career field has such a variety of assignments that most officers will obtain a career broadening assignment and will not have to leave the career field. In fact, the officer can go from second lieutenant to major general in the field without leaving it. However, many officers broaden their knowledge of the Air Force and build an experience base through a good career broadening assignment that help develop their executive abilities and potential. An excellent example is the many opportunities for a civil engineering officer with a missile background to use both of these skills in performing an Air Force job.

### Do Not Be Geographically Oriented

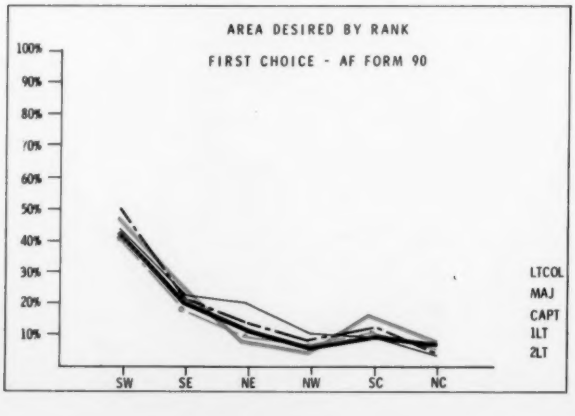
Too often officers become geographically oriented, especially lieutenants and lieutenant colonels. PALACE BLUEPRINT cannot send everyone where he wants to go. People's desires do not always coincide with the locations of jobs. **Figure 3** reflects the popularity of different CONUS areas. Notice that most want to go to the Southwest (SW) and Southeast (SE) and the least to North Central (NC). Lieutenant colonels are on the low side of the cold areas (could snow removal be the reason?) and second lieutenants are on the high side (may be highly correlated with home of record). **Figure 4** shows officers' first choice of area and where the jobs are. PALACE BLUEPRINT calls the difference the "unhappiness gap" because it has to send some officers who want to go to the SW, SE and Northwest (NW) to the Northeast (NE), South Central (SC) and NC.

PALACE BLUEPRINT does not suggest that an officer should not ask for his favorite locations; in fact, he should continue to do so. But it does request that the officer understand why location in filling out an AF Form 90 should not be his only consideration. The officer should be "job oriented;" he should build up his experience; he should go for the jobs that will develop him into an executive and prepare him to be a Base Civil Engineer/Squadron Commander, etc. PALACE BLUEPRINT will continue to consider geographical preferences and, where possible, make person/job matches in an officer's desired area. Incidentally, PALACE BLUEPRINT is no different than the rest of the support and rated force. Graphs like **Figure 3** and **Figure 4** for both support and rated career fields also show the same "unhappiness gap." California, Florida, Colorado and Texas are the four states most often requested. Europe and Hawaii are the top overseas choices. Many officers desire to go to the same place even though super jobs exist in other areas; however, the right person in the right job at the right time is what PALACE BLUEPRINT is striving to achieve on each personalized officer/job match.

**Figure 3: Popularity of different CONUS areas.**

**First Choice—AF Form 90**

| | SW | SE | NE | NW | SC | NC |
|---|---|---|---|---|---|---|
| LTCOL | 44 | 23 | 9 | 5 | 14 | 5 |
| MAJOR | 44 | 21 | 12 | 7 | 11 | 5 |
| CAPTAIN | 45 | 21 | 13 | 7 | 11 | 3 |
| 1LT | 45 | 21 | 11 | 8 | 11 | 4 |
| 2LT | 43 | 22 | 16 | 7 | 9 | 3 |



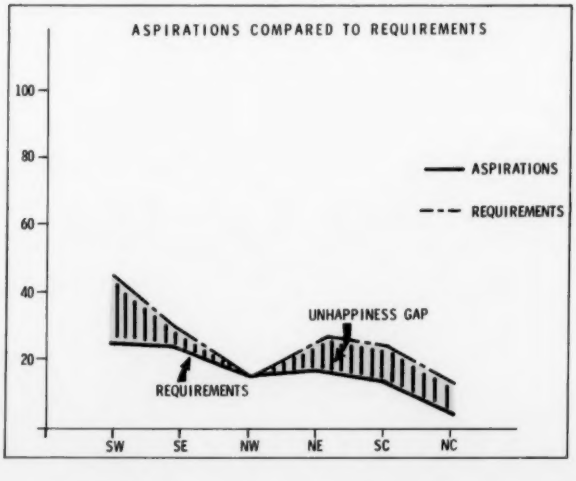

### When Do You Submit An AF Form 90?

The officer should submit a new Career Objective Statement anytime his career plan changes. The requirement that each officer update an AF Form 90 every three years has been deleted. Officers may submit updated Forms 90 whenever they desire. Remember, they are used by the Professional Military Education Designation Boards (Intermediate Service School (ISS) and Senior Service School (SSS) and by major commands in selecting officers for Squadron Officer School (SOS) in residence. Therefore, the officer should use the remarks section and have a current AF Form 90 with meaningful comments.

Forms 90 are no longer included in an officer's master personnel folder reviewed by the temporary and permanent promotion or regular augmentation boards. The officer should not write to impress people, but to give people the information they need to know in deciding his assignment. (This will also be used at other than assignment times.)

In the remarks section, the officer can add anything he deems appropriate for PALACE BLUEPRINT to know when it makes his assignment. Some examples are a medical problem concerning a member of the family (though it does not qualify for a humanitarian assignment, but certainly is important to the officer); a need to be assigned near a certain college (if known, give its location) to finish a graduate degree; and personal information

**Figure 4: Officer's first choice of area and where the jobs are.**



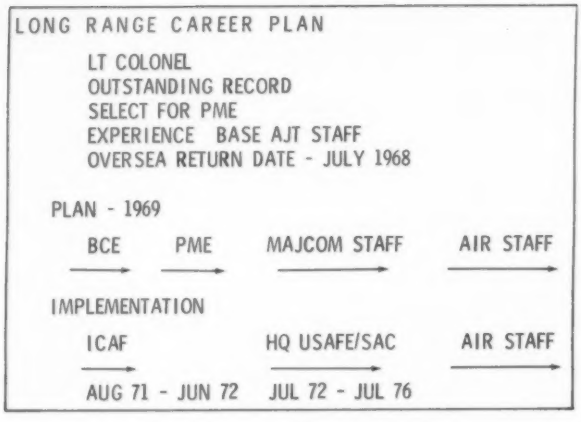



**Figure 5: An Engineering officer's career plan.**

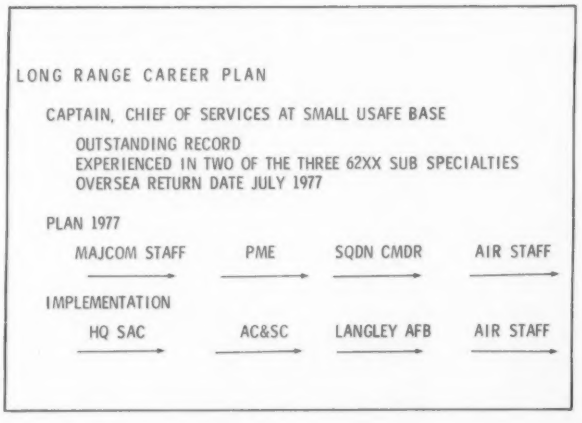



**Figure 6: A Services officer's career plan.**

(wife has a specialized/technical degree and the officer desires to be near an area that is conducive to her career). If an officer has special experience (civilian or military), provide it also for PALACE BLUEPRINT information.

### A Career Plan

One of the real values of preparing an AF Form 90 is that it allows PALACE BLUEPRINT the opportunity to formalize a career plan that identifies its goals (education, experience, etc.) with a clear cut path to reach them, and provides PALACE BLUEPRINT with a short and long-range plan.

**Figure 5** represents one officer's career plan. It was developed in 1969 and placed on a vugraph chart and used by PALACE BLUEPRINT in its "spread-the-word" briefings to officers. Notice that he first assessed his current status. He then looked at his next three assignments. In this case, since he was already nominated for SSS, one of his next assignments was for an SSS in residence.

The bottom shows the implementation stage of his plan beginning with ICAF, then Headquarters USAFE. However, this particular officer's performance and potential were so great, he quickly rose to two Deputy Chief of Staff/Engineering and Services major command assignments, and still may have Air Staff in his future. The officer is Brig Gen Clifton (Duke) Wright, Jr, currently the Deputy Chief of Staff/Engineering and Services, Headquarters Strategic Air Command.

All officers cannot have a career plan that realistically matches this example; however, each officer can establish the next three or four jobs he should have for career development and progression.

In many cases, PALACE BLUEPRINT can work out a plan that includes key jobs it needs to fill without involving an officer in a PCS assignment. For example, a 5525C lieutenant with two years in Engineering Design may go into Program Development Planning/Construction Management for a year prior to an overseas assignment. Another excellent plan is a senior major with two years in Programs who moves to Chief, Operations and Maintenance.

**Figure 6** shows a plan for an outstanding captain in the Services career field. Career plans can be more complex and sophisticated than what has been discussed. Many plans are available for career progression in the career fields. Often, plans with alternative courses of action are helpful. The officer should develop his own and make it as detailed as he believes necessary. He should update it as changes occur.

Career planning is a basic part of executive development. It is an officer's current record of career goals and is used in several decision making processes that affect him, his family and his career.

*(continued on page 28)*

COLONEL HOWELL *is Chief, Technical Career Management Section, and Chief, PALACE BLUEPRINT Team, Air Force Military Personnel Center, Randolph AFB, Texas. He earned his bachelor's degree in mechanical engineering from Mississippi State University and his master's degree in industrial engineering from the University of Pittsburgh. He is a registered Professional Engineer in Alabama and is a member of several professional societies.*

CAPTAIN PACK *is the Services Career Manager, PALACE BLUEPRINT, Air Force Military Personnel Center, Randolph AFB, Texas. He received his bachelor of science in education in English/Language Arts from Arkansas State University, and is a candidate for the master of business administration degree from Webster College.*

# WORTH NOTING

## Environmental Information Systems Available to Help Planners

The Environics Directorate of the Air Force Civil Engineering Center (AFCEC) at Tyndall AFB, Florida, has three Environmental Technical Information Systems available to help planners identify the impacts of their proposed environmental activities and offer suggestions to mitigate the impacts. These systems comprise a computerized approach to environmental analysis which will help the Air Force comply with the National Environmental Policy Act.

The systems are: (1) Environmental Impact Computer System which identifies possible environmental impacts and provides technical information as an aid for impact analysis; (2) Computerized Environmental Legislative Data System which presents summaries of state and federal laws, as well as tables of standards that apply to environmental considerations; and (3) Economic Impact Forecast System (EIFS) which forecasts results of economic changes with socio-economic impacts such as expenditure of federal dollars affecting local businesses, households and governmental expenses.

All questions and requests for input forms should be directed to Capt Richard E. Padgett or Amn Dennis E. Strutz, AFCEC/EVP/21, Tyndall AFB, Florida 32401, or call AUTOVON 970-4207.

## Recommendations Have Been Developed on Energy Monitoring Control Systems

Establishing criteria and discerning the most cost effective utilization of Energy Monitoring Control Systems (EMCSs) have been the subject of intense study by major air commands in the past year and a half. Various major command experiences on the application of the EMCS have been exchanged and, as a result, certain recommendations have been developed.

Air Training Command/Civil Engineering (ATC /DE) and the 3770th Technical Training Group, Sheppard AFB, Texas, held a meeting recently at which time functional managers with operations and maintenance experience as well as base level personnel experienced with EMCS, made known their recommendations for the necessary skills and training required for personnel.

Currently, the Air Staff is reviewing the recommendations for skills and training. The recommendations are being directed toward implementing the 29 March 1976 change to **AFR 85-10** which authorized a separate instrument and control shop, an electronic control/maintenance function and the EMCS operations unit. Flexibility was provided for these new functions to be arranged vertically in the O&M organization or they could be grouped into a horizontally expanded function called Systems Management. The commands validated the necessity for considerably more training so that technicians could adequately service, maintain, balance and fine tune the automatic temperature controls on heating, ventilating and air conditioning (HVAC) systems; also, the training must include systems application and solid state device troubleshooting and maintenance. It was agreed that, in order to maintain the necessary proficiency level, the skills of the technician must be dedicated to controls.

Staffing of the draft guide specification is presently in progress. The specification is performance oriented and designed for competitive bidding, sole source negotiations and two-step procurement methods. Review comments will be considered.

EMCS is a proven method of conserving energy and a viable tool for improving maintenance capabilities and utilities management. The Air Staff and major commands are working to provide the guidance and support required to permit the bases to obtain the maximum payback on the Air Force investment. Inquiries and recommendations should be sent to ATC/DEMU, Randolph AFB, Texas, AUTOVON 487-2774.

Programs is moving in all funding areas to simplify the way we do business and to relieve the pressure on the commands and bases. For a current evaluation of what is involved, here's the latest on

# WHAT'S NEW IN PROGRAMMING

by Bernard C. Meredith, PE

What's new in programming is a product of forces and objectives beyond Air Force control coupled with changes within our domain that are intended to provide more stability in the programming process and reduce the work load of all concerned.

**Figure 1** shows the causes of what is new in programs. Each will be discussed; the "new" interests of Congress, auditors and reviewers will be explained and additional discussion will explain what is being done in the Air Staff to minimize to the extent possible, the unintentional but nevertheless dibilitating impact of the first three items in the **Figure.** It all starts with authority and funds. If we had unlimited amounts, we could satisfy all our needs. We all know this is neither possible nor practical so let us turn to a better understanding of the system and the new interests at each level.

Congress has given many specific directions this past year which indicate its concerns and gives us insight into what may be to come, **Figure 2.** First, in the area of design, the Senate Armed Services Committee has picked up one of the principles used to some extent by the House Appropriations Committee in prior years. The Senate Armed Services Committee has stated that substantial progress must be made on design of **each** project by the time the Committee reviews the program. This is intended to assure good cost estimates, justifications and descriptions of work and that authorization can be used in the year requested. This impacts greatly on project selection in our proposed program. As examples, if criteria is not available, sites not selected, or country to country agreements not consummated, the project is too early.

In the case of incremental funding, Congress had long said that this was a "no-no" because it amounted to obligating succeeding Congresses to provide additional authorization and funds to construct a useable facility. This year, Congress showed that it was as good as its word and fully authorized and funded the Aeropropulsion Systems Test Facility at Arnold Engineering Development Center at $437 million even though major contracts for this national facility will not be awarded this year. We still have to face the issue with the Vandenberg Space Transportation System facilities which is coming up in FY 1979 and which we had originally planned to program in two years. It should be noted that Congress has not expressed any concern about phased programming, that is, doing part of a dormitory requirement one year and part the next. Phasing is not an issue but there is a fine line between phasing and incrementing.

Section 612 is mentioned to point out that the Military Construction Program (MCP) is sometimes held in ransom for something that displeases the Congress. Section 612 provided for lengthy Congressional review of base closures and substantial reductions. It was vetoed. It was subsequently amended and passed in a less objectional form, primarily one of timing of advance notice and length of time the section was to be effective.

Cost benefit analysis has become increasingly important in securing approval of projects. It has extended from projects which are justified on the basis of economy — Depot Plant Modernization Program for example — to virtually all projects. We have contended that a **formal** cost benefit analysis was unnecessary except for self-amortizing projects and in the selection of designs after approval, but we are losing out. The House Appropriations Committee made this clear in disallowing our very limited bachelor housing modernization program for FY 1977. The grounds were that we were virtually gutting old buildings to provide semi-private baths at considerable cost and that a cost benefit analysis had not been made to demonstrate the value of such an improvement. We end up with modern interiors in structurally old buildings which would soon have to be replaced. We have met with the Chairman and our current guidance and proposed FY 1978 MCP satisfy the concern expressed in the Committee report.

Minor construction was another area hard hit by the House Appropriations Committee. The Com-

**Figure 1: Causes**

- Air Staff Review, Coordination and Direction
  - Stable Program
  - Reduced Workload
- Congress
- Auditors
- Reviewers

mittee's Surveys and Investigations staff uncovered a number of questionable projects and, as a result, the Committee put, "responsible managers on notice that they may, at any time, be called upon to justify their actions in approving such projects." Further, the Committee directed that all equipment and installation costs funded from other appropriations be shown on an attachment to the 1391. Also, copies of the 1391s are to be furnished to the Committee at the time the project is initiated. This restriction currently applies only to research and development facilities and we are working on a reasonable interpretation and implementation.

This brings us to another group which influences the way we program. The Auditors and Reviewers include the Government Administration Office (GAO), the DOD and Air Force auditors, DOD and OMB budget analysts and installations people. They all audit and review for compliance with the law. But more important is their interpretation of Congressional direction. It is reflected in everything they do: their audits, their directives and their policy. For example, GAO is looking into cost benefit analysis. It is trying to develop a case that we do not have but should have such an analysis on each project. This audit is still active. Again, our position is that an analysis is not required on each project, but if Congress requires one on a project, we provide it. Another example concerns the Sikes Committee comment on bachelor housing upgrade. It was the seed for a DOD policy letter that we could not live with. It all but prohibited semi-private baths in dormitory upgrades. It also required extensive cost benefit analysis. We have since received verbal agreement to proceed with our program so long as we upgrade permanent, not wood, dormitories.

Another example of interpretation is that all large programs must be fully funded. OSD provided Space Transportation System facilities funding over a two year period by its own Program Decision Memorandum. Then, it raised the question of incremental funding. Over $100 million in budget authority is at risk here. Interpretation of Congressional desires by others really influences what is new in programs.

We must comply with the expressed and implied desires of the Congress and the reviewers in OSD and OMB. Yet, we have a number of new initiatives to reduce the directed workload in the programming system. This is a **tall order.**

**Figure 2: Congressional Direction**

- Design
  - Incremental Funding
    - Phasing
      - Section 612
        - Cost Benefit Analysis
          - Bachelor Housing
            - Minor Construction

As we all know, there are many ways to get authority and money to work on facilities: MCP, P-341, NAF, O&M and the emergency authorities. If we can systematically plan for our requirements, we are on the right road no matter which authority we plan to use. Each of the authorities and what we plan to do will be discussed briefly. Coordination up and down and reduction of lost motion are the keys.

The Budget and Impoundment Act of 1974 put an extra year on the MCP programming cycle. It now takes almost a three year head start to get a project approved by Congress. As a result of this expanded programming cycle, programming and design actions are taking place on three programs at any one time. (Final Congressional action was being taken on the FY 1977 MCP while we were developing the FY 1978 and 1979 MCPs). There are actually two MCP cycles involved. The first cycle submits the MCP to OSD as next year's authorization program. The second cycle submits it to OSD as the Budget a year later. We have developed formal milestones and decision points in the MCP programming and design cycle. These milestones were published in an All Major Command letter in October 1976. Here it should be pointed out that Congress has yet, over the past two years, to consider or pass the outyear authorization. This has escaped somewhat unnoticed, but we are still required to program two years. The day will come when we will be locked into what we have programmed. The FY 1978 MCP is really behind us as far as development is concerned. PBDs, submitting the budget to Congress and the hearings are yet to come. FY 1979 is where we hope to make progress.

On Project Books, we have ceased calling for them with the program submittal. Instead, when the program goes to OSD in October, we will send the whole project list to the major commands. At this time, commands will be requested to prepare and submit project books. We will also advise the commands of subsequent budget decisions by OSD. Project Books will be requested only when there is reasonable expectation that projects will survive and be sent to Congress. Remember, we are talking now about the FY 1979 MCP and we are getting an early start but without the former gross effort on project books for an entire command wish list. In addition, we are attempting to reduce the detail required in project books.

As to design, we will follow a similar procedure as for Project Books. We will designate prime, normal and constrained projects. By definition a prime project is one that should survive OSD review. It has a fully supported negative environmental determination, has no base closure problems, mission change problems or equipment delivery problems, has criteria available, will be designed and constructed by the Army or Navy, and has been approved by the Director of Engineering and Services as a prime project. Next is a normal project which is one that was not designated as a prime project but still meets most of the prime project qualifications except that it is proposed to be designed and/or constructed by the Air Force. The third category is a constrained project, meaning that it has a problem on environment, siting, mission change, criteria or the like. It is one that may well be a high priority project but one on which design cannot be initiated. We expect to start design of prime projects in the FY 1979 MCP in February 1977. We have designated about 40 percent of the program in this category. These projects will not be considered for substitution. Normal projects will be authorized for design soon after the commands submit their 1 May program. We expect the constrained projects to be few in number since we will not be able to release them for design until after October. (They are really candidates for the FY 1980 MCP.) We plan to complete our review of the FY 1979 MCP by mid-August 1977. This will permit adequate time for staffing before the 1 October budget submittal.

The criteria for selection of projects such as siting, environmental, criteria availability have been mentioned. We use a formal checklist. If command programmers would use the same yardstick, the success rate should continue to improve.

The FY 1978-79 program submitted to OSD in October included most of the command priority projects except where procurement programs, design criteria or other considerations indicated poor chance of approval by OSD, OMB or the Congress. Both the FY 1978 and 1979 MCPs had total DCS coordination in the Air Staff. These programs are much improved over the FY 1977 MCP where we had only about $60 million for regular command sponsored projects. The equivalent level in FY 1978 and 1979 is about $300 million. Currently, the FY 1980 through FY 1982 are further improved but these levels must be substantiated by good quality projects in order to be sustained in the final competition for dollars in the Air Force budget.

**(Editor's Note: Subsequent to this presentation, a Program Budget Decision (PBD) was made which approved only $317 million total for FY 1978 and deferred the remainder, some $412 million, to FY 1979. Thus, PBD action makes FY 1978 another lean year, wiping out the gains made during the budget development process.)**

The 7116 Report takes on added significance as we go into our effort toward stable programs and full disclosure. This report was formerly an exercise in futile dreams. It never seemed to get purified as outyear program levels and project selections were made. We intend to correct previous problems with full disclosure of the program content in the current and outyears. Our plan is to make it realistic as to funding level. It will really constitute the program making up the FYDP and thus be the derivation of the command boggies.

This requires full disclosure to the commands. This is also new. Heretofore, it was a guessing game by commands as to what was included in the Air Force program until after the PBD cycle was completed. It was about January before commands really knew what was in the proposed programs. If this is to work as we intend, it is up to the command engineers to keep the Commander pressures down. Commander support for projects after they have been deleted are no good.

All they really indicate is that a project was poorly justified the first time. We can handle this problem directly, but the commands are the big players.

In the MCP area, you can see what is new:

- There is reduced pressure on early development of project books.
- There is earlier design.
- Commands have much earlier information in proposed program content.
- We have a better level of funding for commander requirements.

As mentioned earlier, Congress decimated our FY 1977 program. There was criticism of upgrading wood frame dormitories and failure to conduct a full cost benefit analysis on upgrades. In addition, OSD reacted with a policy letter which all but precluded modernization to include semi-private baths. Following several meetings with Congressional and OSD staffers, a final agreement was made on what could or could not be included in the Air Force Bachelor Housing Upgrade Program.

Five basic requirements were agreed to:

- The basic dormitory structure to be upgraded will be of permanent construction such as concrete frame, masonry block wall so when the project is complete we will have a dormitory that will last for at least 25 years.
- There will be minimum interior modification and demolition and no removal of load-bearing walls.
- Dormitories should require other extensive upgrade work as well as conversion to semi-private latrines. At overseas locations, the rule still holds that central latrines will not be converted to semi-private latrines, just modernized.
- The cost to upgrade dormitories including conversion to semi-private latrines will be less than 65 percent of a new dormitory cost.

● The cost delta between central latrine upgrade and converting to semi-private latrines will not be greater than 35 percent.

A few things new in the energy program are worth noting. To begin with, the program has been substantially redirected. Last year, we were directed to devote a level of effort of $60 to $80 million per year to energy construction in the outyears. The Air Force in the development of the POM in May had to dip into this level to help finance other Air Force programs such as the F-15 and F-16 buy. OSD Installations and Logistics (I&L) insisted that the program level be increased. Construction with a 10 year payback was the goal. The infighting culminated in a decision which redirected the program to projects with a maximum six year payback and further reduced the level of funding. As it stands now, the FY 1978 MCP will be the last program with substantial energy reduction construction in it, almost $50 million. The FY 1979 and outyears will contain about $10 million each.

With the reduced program, the selectivity becomes crucial and we expect audits of the results. We must be selective in the projects we include in our program and must provide a good audit trail to assure auditors of our stewardship of the program.

The next category of projects are those funded with nonappropriated funds (NAF). Actually, we acquire about $40 million worth of construction under this authority and from this fund source. There are several new things in the nonappropriated fund area.

AFCOMS is new and its Board of Directors has the authority to approve commissaries; AFCOMS has a responsibility for determining its requirements and is responsible for functional layouts. AFCOMS is the fund manager and the requirements consultant. Of course, we have to process projects through the same NAF procedures in the Air Staff for consideration of mission, population changes and the like. In that, there is no change.

In the case of Welfare Board projects, there are a number of changes pending. The Board Chairman is expected to get authority to fund cost increases after the Board approves a project. We note also that the Welfare Board does not intend to release funds until the NAF project is ready to advertise. In addition, the Military Personnel Center and our Engineering Division plan to review and approve functional layouts before processing programming documents.

Lately, Congress has expressed special interest in NAF projects as evidenced by the change in funding source for CONUS commissaries. There was even some mention made last year in one of the Committees that Congress should approve/authorize NAF projects. This concept was not approved, but it is indicative of the care we must exercise in building facilities, even with our own money.

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The P-341 area is really one of the most productive areas for getting the worrisome, nuisance work done. To help make the system more responsive, we have done away entirely with project books on minor construction. This will place a big burden on the Commands to do their job on design. We would expect most design to be done in-house, but if A-E services are used, selected data that normally is included in a Project Book will still be required to establish the scope of work for the designer.

Another new concept in minor construction is that we are reorganizing in the Programs Division to provide full service on P-341 and NAF projects. This includes design releases, fund increases and time extensions. This reorganization should make it easier on commands by having one point of contact. It will save us time in processing, too. Another thing, we are following up on projects authorized for design. If we do not hear in four months that design is 35 percent complete, we suspend the project.

Another funding category is O&M which is a real bread and butter authority. There are lots of flexibilities under this authority. We know that we can mix maintenance and repair with alteration. We can improve facilities as we repair them and there is no top limit except the limits of the O&M budget. However, there are limitations as to what we can approve within the Air Force without going to the Secretary of the Air Force. In the case of maintenance, we have complete authority within the Air Force. In the case of repair, we are limited to $300,000; however, we recently collaborated with the Army in requesting an increase in service authority from $300,000 to $400,000.

It is stressed here that copies of Air Force approved repair projects go to OSD. We get regular calls from OSD requesting details on the scope of work. OSD's principle interest is in classification of work: repair versus construction. We have been successful in avoiding adverse determinations thus far. However, the problem still lurks in OSD that one of the projects we approve one of these days may be subject to an adverse determination.

In summary, Programs is moving in all funding areas to simplify the way we do business and to relieve the pressure on the commands and bases. We must recognize that Congress drives the way we operate and the reviewers interpret and elaborate. Nevertheless, we do our best to ease the burden on the commands and bases within the constraints imposed on us. E&S

# Memorandum

## For Entire PRE Staff

**SUBJECT: Goals—Objectives for Every Individual Assigned to PRE**

1. Well-informed senior members of our staff, military and civilian, who are made to feel as partners in all our activities.
2. A civilian force that feels as though they are full partners on the PRE team — and are.
3. Junior members who are permitted to carry the ball at the earliest possible time. I want high visibility for them.
4. Interested, concerned, capable managers/supervisors who are people oriented — and demonstrate it by their actions.
5. A fully informed staff that knows, understands, believes and works toward our goals and objectives — in everything they do.
6. A staff that constantly looks for better ways to do things — preferably simplified and with less paperwork.
7. A staff that fully recognizes that everything we do must point toward a single objective: to help our people at base level support the mission and the commander in the best possible way and to the maximum possible extent. A headquarters exists for one reason — to help Air Force bases support their missions.
8. A staff that practices what this memo states.

ROBERT C. THOMPSON
Major General, USAF
Director of Engineering and Services

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